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Treatment of Single Tooth Anterior Crossbite in Mixed Dentition: A Case Series

Tek Diş Anterior Çapraz Kapanışın Karışık Dişlenme Döneminde Tedavisi : Vaka Serisi

Treatment of Anterior Crossbite

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Treatment of Single Tooth Anterior Crossbite in Mixed Dentition: A Case Series

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ABSTRACT

An anterior crossbite is defined as the positioning of one or more maxillary incisors on the lingual aspect of the mandibular incisors when the jaw is in centric occlusion, resulting in a reverse overjet. Crossbites are anomalies that can be seen from the period of deciduous dentition, cause different complications and involve many treatment options. It has been reported to cause complications ranging from tooth attrision to TMJ dysfunctions. The aim of this case series is to present the diagnosis, complications and treatment of single-tooth anterior crossbites with removable appliances. In this study, the treatment of three patients with single-tooth anterior crossbite with removable appliances is presented. In all cases, treatments were completed within a maximum of 2 months without any issues related to patient cooperation or comfort. Removable appliances, which have been extensively utilized in the treatment of anterior crossbites since their introduction, remain a preferred choice among clinicians today due to their predictability, hygiene advantages, and enhanced comfort compared to other methods.

Anahtar Kelimeler: Anterior Crossbite; Removable Appliance; Early Intervention

ÖZET

Anterior çapraz kapanış, sentrik oklüzyonda bir veya daha fazla üst kesici dişin alt kesici dişlerin lingualinde konumlanması ve ilgili bölgede ters overjet oluşumu olarak tanımlanır. Çapraz kapanışlar süt dişlenme döneminden itibaren görülebilen, farklı komplikasyonlara sebep olabilen ve birçok tedavi seçeneği içeren anomalilerdir. Dişlerde atrizyondan, TME disfonksiyonlarına kadar uzanan komplikasyonlara sebep olduğu bildirilmiştir. Bu vaka serisinin amacı tek diş anterior çapraz kapanışların teşhisi, sebep olabileceği komplikasyonlar ve hareketli apareyler ile tedavisini aktarmaktır. Çalışmada tek diş anterior çapraz kapanışa sahip üç hastanın hareketli apareylerle tedavisi sunulmuştur. Tüm olgularda hastalarda kooperasyon ve konfor eksikliği görülmeden en geç 2 ayda tedaviler tamamlanmıştır. Tanıtıldığı ilk zamandan itibaren yaygın bir şekilde anterior çapraz kapanışların tedavisinde kullanılan hareketli apareyler, sonuçların diğer yöntemlere göre daha öngörülebilir olması, daha hijyenik ve daha konforlu olması gibi özellikleri bir arada taşıdığından dolayı günümüzde de klinisyenler tarafından yaygın bir şekilde tercih edilmektedir.

Keywords: Anterior Çapraz Kapanış; Hareketli Aparey; Erken Müdahale

Introduction

An anterior crossbite is defined as the positioning of one or more maxillary incisors on the lingual aspect of the mandibular incisors when the jaw is in centric occlusion, resulting in a reverse overjet.[1] The reported prevalence of anterior crossbite in the litarature varies between 2.8% and 15.1%, depending on the ethnicity of the included subjects and whether cases of edge-to-edge incisor contact are included.[2-9] According to its origins, there are three different types of crossbite: dental, skeletal, and functional. Dental crossbite is less complex and simpler to manage than skeletal and functional crossbites. The most common etiologic factor for this type of crossbite is lack of space for the permanent incisors, mandibular anterior crowding, the presence of a supernumerary tooth in the maxillary anterior region, and trauma to maxillary primary teeth reorienting a permanent tooth bud or buds lingually.[10,11]

If anterior crossbite left untreated, it can cause attrition, gingival recession and alveolar bone loss,[12] TMJ dysfunction,[13] and growth problems in the maxilla and mandible can be seen in teeth affected by crossbite.[14] Therefore, it's highly recommended to correct an anterior crossbite in the early mixed dentition to allow a normal development of the teeth, occlusion, and jaws.

Several methods have been used for anterior crossbite correction in the mixed dentition, including tongue blade,[14] resin-containing material as an inclined planes,[15] posterior bite opening,[16] 2 × 4 fixed orthodontic treatment,[17] and removable appliances.[18] There are some advantages with removable appliance therapy; i.e. etching, bonding, and debonding procedures are avoided, a posterior bite block added to the appliance eliminates the need for bite block materials, reduced chair time activation and when a removable appliance is used proper oral hygiene will not be as challenging as when fixed appliance therapy is inserted. The aim of this case series was to present the treatment of anterior single-tooth crossbite using removable appliances with a labiolingual spring during mixed dentition. Written informed consent was obtained from all three patients.

Case Presentation - 1

The patient (Y.K.B.) had a chronologic age of 9 years, was referred to our clinic with the chief complaint of teeth crowding, and was found to have no systemic disease in the anamnesis. The intraoral examination of the patient, who had a balanced profile, revealed inadequate oral hygiene, crossbite on tooth number 21, maxillary anterior deficiency, anterior deep bite, and an Angle's Class I molar relationship.

A removable appliance with a labiolingual spring was planned for the patient. During the first appointment for fitting the appliance, the labiolingual spring was activated 1.5-2 mm. After the appliance was worn for 18-20 hours a day, the crossbite was corrected by the follow-up visit after 1 appointment (1 month) (Figure 1-2)

Figure 1. Case-1 Pretreatment

Figure 2. Case -1 Posttreatment

Case Presentation - 2

The patient (E.E.Ş.) had a chronologic age of 10 years 4 months, was referred to our clinic with the chief complaint of teeth crowding, and was found to have no systemic disease in the anamnesis. The intraoral examination of the patient, who had a balanced profile, revealed inadequate oral hygiene, crossbite on tooth number 11, mobility and gingival recession on tooth number 41, and an Angle's Class I molar relationship.

A removable appliance with a labiolingual spring was planned for the patient. The labiolingual spring was activated 1.5-2 mm per month. After the appliance was worn for 18-20 hours a day, the crossbite was corrected by the follow-up visit after 2 appointments (2 months) (Figure 3) (Figure 4).

Case Presentation - 3

The patient (E.P.A.) had a chronologic age of 11 years, was referred to our clinic with the chief complaint of teeth crowding, and was found to have no systemic disease in

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the anamnesis. The intraoral examination of the patient, who had a balanced profile, revealed good oral hygiene, crossbite of tooth number 21, and an Angle's Class I molar relationship.

A removable appliance with a labiolingual spring was planned for the patient. The labiolingual spring was activated 1.5-2 mm per month. After the appliance was worn for 18-20 hours a day, the crossbite was corrected by the follow-up visit after 2 appointments (2 months) (Figure 5-6)

Figure 3: Case-2 Pretreatment

Figure 4: Case-2 Posttreatment

Figure 5: Case-3 Pretreatment

Figure 6: Case-3 Posttreatment

Appliance design

Removable appliances basically consist of 3 elements: an active element, a retaining element, and an acrylic base. The appliances used in our cases included a labiolingual spring (also known as a Z spring or double-cantilever spring) as the active element, an Adams clasp and labial arch (vestibular arch) as the retaining element, and an acrylic base. (Figure 7-8)

An important point to be considered in appliance design is whether a labial arch should be added. If it will not allow protrusion of the crossbite tooth, it should not be added to the appliance at all. For extra retention, a C clasp or ball clasp can be added where the premolars come into contact.

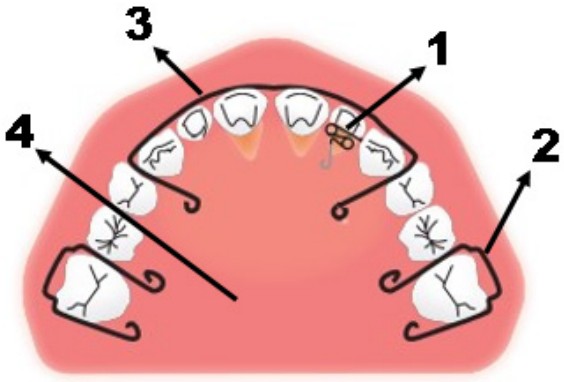

Figure 7: Design of a removable appliance with a labiolingual spring 1. Labiolingual spring - 0.5 mm round stainless steel wire. 2. Adams clasp - 0.7 mm round stainless steel wire. 3. Labial (vestibule) arch - 0.7 mm round stainless steel wire. 4. Acyclic plate – It should be 2-3 mm thick.

Figure 8: Removable appliance with a labiolingual spring

Discussion

Considering that the first orthodontic examination should occur at age 7, the mixed dentition period is the most critical time for diagnosing and treating an anterior dental crossbite. Treatment of such malocclusions within interceptive orthodontics prevents the occurrence of complex malocclusions. Vakiparta et al.[19] reported that early intervention may contribute to the significant reduction in treatment need from eight to 12 years of age. Only occasionally, however, is it indicated to correct this type of crossbite during the primary dentition stage, because crowding severe enough to cause it is rare at that stage and the primary incisors often exfoliate before they can be successfully moved.10 In addition, cases of crossbite seen in this period mostly spontaneously correct.[20] The choice of method for correcting a single-tooth anterior crossbite depends on the number of teeth involved, the patient's age, the stage of root development, the degree of overbite, patient cooperation, and the amount of correction required.[21]

The simplest method used to correct a single tooth anterior crossbite involves the patient using a tongue blade.[14] The method is unsuitable for routine use in clinics because of its clinical unpredictability, the patient's inability to regulate bite force, and the potential for root resorption caused by heavy forces.

There are cases reported of crossbite treatment by creation of an resin-containing material as an inclined planes.[15,22,23] Clinical application is cost effective and easy. However, such techniques may induce occlusal trauma by exerting disproportionate stress on individual teeth. Because there is no established method for shaping the material, the treatment becomes unpredictable. In very young children, uneven force distribution may also lead to a risk of swallowing parts. Despite its use in clinical settings, integrating this method into a standardized protocol remains difficult.

Another method that may be used in the correction of crossbite is 2 × 4 fixed orthodontic treatment.[24,25] The 2x4 appliance comprises bonds on the maxillary incisors, bands/tubes on the first permanent maxillary molars and a continuous archwire. It can be used in cases where there is not enough space for the crossbite tooth and more complex tooth movements (Such as rotations, diastemas, incorrect tooth inclinations and angulations) can be performed, however, application to a patient in the mixed dentition period disrupts the patient's oral health-related quality of life and oral hygiene is more difficult than with removable appliances.[20] It is also an invasive approach due to the etching, bonding, and debonding procedures. Root development continues throughout the mixed dentition period, and thus the effects of continuous force from fixed orthodontic appliances on developing roots are not yet fully understood. In Case 2 (E.E.Ş), the patient was referred to our clinic with poor oral hygiene, mobility of the lower incisor, and gingival recession; therefore, prompt initiation of treatment was necessary. In patients with poor oral hygiene, the use of resin-based materials for inclined planes or the application of a 2 × 4 fixed orthodontic appliance can be problematic due to challenges in material bonding and the increased difficulty in maintaining oral hygiene. In most cases, the posterior bite needs to be opened because the crossbite tooth is in contact with the lower incisors in the resting position. This complicates the application of 2 × 4 fixed orthodontic treatment. During the first three days, the pain intensity is higher compared to removable appliances,[26] thereby negatively impacting the patient's quality of life. Another problem with fixed appliances is the distally extended archwire behind the molars tubes can be dislodged during eating or brushing.[17] This factor is among those that negatively affect treatment outcomes.

Among the methods described in the literature, the most commonly used is a removable appliance with a labiolingual spring. Correction of anterior single-tooth crossbite with removable appliances can be achieved in a very short time when the patient cooperates. The advantages of these appliances include:[27] in many cases of dental crossbite, results can be achieved with the simple tipping movement provided by removable appliances; a posterior bite block added to the appliance eliminates the need for bite block materials that may need to be applied in other methods; they are simple to fabricate, easy to maintain and repair, reduce chair time activation, can be managed by any dentist, and are less visible. They have the following disadvantages:[27] patient cooperation is required; bodily movement and multiple rotations cannot be corrected; they are not indicated in certain skeletal cases;

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in extraction cases, uprighting of the roots of canines and 2nd premolars is not possible; and the amount of activation is minimal, which in turn affect tooth movement.

Removable appliances facilitate patient preparation for more complex future treatments and effectively address the primary issue. They are relatively easy to maintain in terms of hygiene, and the risk of white spot lesions[28] and gingivitis is significantly lower compared to fixed orthodontic treatments.

Conclusion

Although various methods have been proposed in the literature for treating single-tooth anterior crossbite, removable appliances remain a significant and clinically predictable approach, offering the most favorable benefit-risk ratio in crossbite cases observed during mixed dentition.

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