Case Report

Correction of Anterior Dental Crossbite using Removable and Fixed Appliance

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Abstract

Single tooth anterior dental crossbite is the commonly confronted malocclusion during the development of occlusion in children. Different techniques have been used to correct anterior crossbites. This article describes two such cases. In first case, the correction of single tooth anterior crossbite was done using a Hawley's appliance with double cantilever spring and posterior bite plane. In second case, single tooth anterior crossbite was corrected using a fixed appliance (MBT). Anterior dental crossbite needs early and prompt treatment to avoid anterior teeth mobility, fracture, periodontal pathosis, and temporomandibular joint disturbance.

Keywords: Anterior crossbite, Doublé cantiléver spring, Hawley's appliance, Fixed appliance.

Introduction

Anterior crossbite is defined as an abnormal labiolingual relationship between one or more maxillary and mandibular incisor teeth. Anterior crossbite draws attention of the parents because of the esthetics and functional concern. Graber defined crossbite as a condition where one or more teeth may be abnormally malposed either lingually or labially with reference to opposing teeth 1.[1] It is the responsibility of pediatric dentist or orthodontist to guide the developing dentition to a state of normal function.[2] Anterior skeletal crossbites are usually associated with a skeletal problem, such as mandibular prognathism and midface deficiency.

Case Report 1

A 10-year-old patient reported to the Department of Paedodontics and Preventive Dentistry with the chief complaint of unesthetic appearance and crowded teeth. The medical history was not significant. This was patient's first dental visit. Extraoral examination revealed convex profile of the patient. Intraoral examination revealed that the maxillary left permanent central incisor was lingually locked (Figures 1 and 2). In this particular case, a Hawley's appliance with a double cantilever spring or Z spring on the maxillary left permanent central incisor with the posterior bite plane was given. Since the maxillary left central incisor was locked deep behind the mandibular left central incisor, the posterior bite plane was given to help in jumping the bite.

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In this case, Z-spring was indicated as there was adequate space for the labialization of the maxillary central incisor. The patient was recalled after 1 month and the double cantilever spring was activated once every month. The desired results were seen within 5 months. The patient's compliance was good and the patient did not complain of any pain or inflammation.

Case Report 2

A 11-year-old female patient reported to the Department of Pedodontics and Preventive Dentistry, with a chief complaint of irregularly placed upper front teeth for 3 years and also she was esthetically concerned, therefore, wanted treatment for the same. The patient had no significant medical or dental history. No abnormality was detected on extraoral examination. Intraoral examination revealed Angle's Class I molar relation with permanent maxillary right central incisor in crossbite (Figures 3 and 4). Space analysis using the Moyer's mixed dentition analysis showed the availability of adequate space within the arch for realignment of teeth. After discussing

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Figure 1: Pre-treatment photograph

Figure 2: Post-treatment photograph

Figure 3: Pre-treatment photograph

Figure 4: Post-treatment photograph

the treatment modalities with parents, we selected a wire-fixed orthodontic treatment with six pre-adjusted edge-wise brackets with a 0.022" slot (MBT). The MBT appliance was introduced by MacLaughlin, Bennet, and Trevisi in 1998. The brackets were bonded on the labial aspects of the six maxillary permanent incisors. A short nickel-titanium (Ni-Ti) 0.014" round archwire was cut equally on both sides of the centerline and placed into the bracket slots. The wire was stabilized in its position using elastic ties. The patient's bite was raised using 2 mm thickness of glass ionomer cement (GIC) placed on the occlusal aspects of both the mandibular first permanent molars (tooth 36 and tooth 46). Patient was called 3 weeks later for the activation. There was some evidence of anterior movement of the maxillary tooth that was in crossbite. Within four visits after the initiation of treatment, the anterior crossbite was corrected successfully. The 0.014" round Ni-Ti archwire was changed to the 0.016" round Ni-Ti archwire and retained for further 2 weeks before debonding of the brackets (Figure 4). At 3-month review, the incisor teeth were in positive overjet. No retention was provided as adequate overjet and overbite had been achieved. Brackets were debonded, and GIC was removed to relieve the patient's bite.

Discussion

It is very essential to differentiate between dental versus skeletal anterior crossbite in determining clinical treatment. A single tooth in an anterior crossbite is usually associated with some degree of dental crowding.[3,4] This generally results from a dental etiological factor. On the other hand, a segment crossbite (which involves several teeth rather than a single tooth) is more likely to result from a skeletal etiological factor, which can be confirmed by radiographs such as lateral cephalograms.

Anterior dental crossbite has a recorded incidence of 4–5% and usually becomes evident during the early mixed dentition phase.[5,6] Lingual eruption paths of the maxillary incisors usually lead to their palatal malposition. Other etiological factors include: Trauma to the primary maxillary incisors resulting in lingual displacement of the permanent tooth buds, presence of supernumerary anterior teeth, crowding in the incisor region, a habit of biting the upper lip, an over retained, necrotic or pulpless deciduous tooth or root delayed exfoliation of the primary incisors, and odontomas.[3,7,8]

Lee[9] marked four factors to examine before selecting a treatment approach: Adequate space in the arch to reposition the tooth, sufficient overbite to hold the tooth in position following correction, and an apical position of the tooth in crossbite that is the same as it would be in normal occlusion and a Class I occlusion. The best time to treat a crossbite is the 1st time that it is seen.[10]

Anterior crossbite is a form of malocclusion which seldom corrects by itself because the upper incisor is locked behind the lower incisors and advances to severe malocclusion, thus

early treatment can re-establish proper muscle balance and a well-balanced occlusal development. Early treatment is also directed toward preventing dysplastic growth of both skeletal and the dentoalveolar components.[2]

The excellent age for the correction of anterior dental crossbite is between 8 and 11 years during which the root is being formed and the tooth is in the active stage of eruption. An important role is played by the age of the child as well as the motivation for treatment.[2,11]

There are many ways to treat a simple anterior dental crossbite. Various treatment approaches that have been recommended for simple anterior dental crossbite are explained below.

Tongue blade therapy may be used to correct a simple 1-tooth anterior dental crossbite. Patient cooperation and parental supervision are very essential for the success and prognosis of the treatment and moreover, there is no specific control on the amount and direction of force applied. Anterior dental crossbite involving one or more teeth can be treated using a cemented lower inclined acrylic plane. This technique may open the bite if worn for more than 3 weeks.[10] One more method is cementing a reverse anterior stainless steel crown on the lingually locked incisor at a 45° angle to the occlusal plane. This method is subjected to all the disadvantages of the inclined plane method and is difficult to apply to partially erupted maxillary incisors. Hawley retainer with auxiliary springs is used often for minor tooth movement in pediatric dentistry. In this procedure, the prognosis is highly dependent on patient cooperation and parental supervision. Although the use of labial and/or lingual arch wires has proven to be fruitful, the disadvantage of these appliances is the expenditure required to use them efficiently.[10,12-17]

With removable appliance therapy, patient compliance is a major decisive factor of the effectiveness of treatment. While the level of compliance may partly justify the longer treatment duration for the removable appliance, it must be identified if the patient is compliant, then treatment with a removable appliance will have a favorable result. In Case 1, since there was sufficient space for the maxillary central incisor to move labially, a Hawley's appliance with a double cantilever spring was given. A maxillary posterior bite plate was inserted to allow clearance for the crossbite correction. Since the patient's compliance was good, the desired results were seen within 5 months. There are certain advantages with removable appliance therapy, that is, etching, bonding, and debonding procedures are averted, and when a removable appliance is used, proper oral hygiene will not be as challenging as when fixed appliance therapy is inserted. Furthermore, if purely tipping movement of the incisors is required, this can easily be created with a removable appliance. Routine problems encountered with the use of removable appliances include initial speech difficulty due to palatal coverage of the appliance, gradual loosening of the appliance used, and tendency of the patient to flip the loose appliance in and out with the tongue. Besides that, breakage and loss of appliances also happen due to patient's carelessness along with limited tooth movement range, appliance bulkiness, and poor oral hygiene maintenance. 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.[18-20] Most of the problems related to the usage of removable appliances can be overcome with the use of a simple fixed orthodontic appliance. The fixed orthodontic appliance method is convenient for correction of simple anterior crossbite and also consume less time. In a randomized and controlled trial study of fixed versus removable orthodontic appliances to correct anterior crossbite in the mixed dentition by Anna-Paulina Wiedel and Lars Bondemark, it was found that the average duration of treatment was significantly less, 1.4 months, for the fixed appliance group ($P < 0.05$) compared to the removable appliance group.[21]

Conclusion

The main emphasis should be placed on the early diagnosis and the prompt treatment at this early stage of development. Patients must be selected carefully whether using removable appliance or fixed appliance. The crossbite must be a dental crossbite not the skeletal one. The facial profile and occlusion should be Class 1 and there should be sufficient space in the arch for correction of the crossbite. Crossbite of dental origin can be treated using both removable and fixed appliances.

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