CASE REPORT

FIXED APPLIANCES FOR CORRECTION OF ANTERIOR CROSSBITE: A CASE SERIES

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ABSTRACT

Anterior crossbite can be defined as palatal position of the upper anterior teeth in relation to the lower anterior teeth. Unapproached anterior crossbite leads to irregular wear of the lower anteriors, thinning of labial alveolar bone plate and which in turn leads to gingival recession. There are a few strategies for correction of anterior dental crossbite.This case report highlights the use of two novel fixed appliances for correction of anterior crossbite.

INTRODUCTION

Anterior teeth crossbite reports an occurrence of 4-5% and is seen during the early mixed-dentition phase.[1] One of the causes for anterior dental crossbite is trauma to the primary incisor resulting in lingual transposition of the permanent tooth germ.[2] Other reasons for crossbite would be presence of supernumerary anterior teeth, an over-retained necrotic deciduous teeth or root, odontomas, upper lip biting habit, crowding in the incisor region and inadequate arch length.[2]

The fundamental objective in treating anterior dental crossbite is to tip the affected upper tooth or teeth labial to a point where a steady overbite relationship is accomplished. Treatment may include labial movement of an upper tooth or lingual movement of a lower tooth. Different treatment techniques have been proposed to address anterior teeth crossbite which includes tongue blade therapy, reverse stainless-steel crowns, removable acrylic appliances with finger springs, bonded resin-composite slopes, and fixed acrylic planes.[2] In this case report we will be discussing about 2 different fixed appliances for correction of anterior teeth crossbite.

MATERIALS AND METHODS

Case Report 1: Correction of anterior crossbite using Fixed Expansion Screw Appliance.

An eight-year-old male child patient reported to clinic along with his mother, with a main concern about the maligned upper front teeth. Extra oral examination revealed normal profile with competent lips. On intra oral examination Angle's class I molar relation bilaterally, pulpectomy treated and stainless-steel crown present wrt 54, dental caries wrt 62 (grade 1 mobility). Maxillary both central incisors in crossbite with adequate space for crossbite correctionwas noticed (Fig. 1). Fixed expansion screw appliance was selected for the treatment, due to advantages like expansion screws are easier to manage and lesser tendency to dislodge as appliance is fixed. Informed written consent was obtained from mother. Alginate impressions of both jaws were made. The design included molar banding on both maxillary permanent first molars. Expansion screw (Modern orthodontics manufacturers) was incorporated connecting two acrylic plates. The anterior acrylic plate was resting on palatal surfaces of upper central incisors. And the bite was opened by incorporation of posterior acrylic bite plane, so as to achieve incisal clearance. The appliance was cemented with luting GIC (Ketac™ Cem radiopaque) (Fig.2). Activation was carried out twice a week with a quarter turn (90° rotation) for each time at clinic[3-4]. Correction was accomplished in 4 weeks. No retention was provided as adequate overjet and overbite of 2 mm was achieved. The patient was kept on follow up every 6 months. (Fig.3).

Fig. 1: Pre-operative image 11 and 21 in crossbite.

Fig. 2: Intra operative image of the fixed expansion screw appliance.

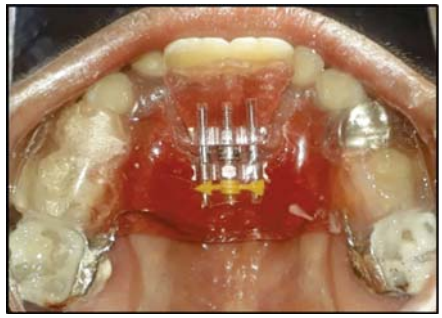

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Fig. 3: Post correction of anterior crossbite w.r.t 11 and 21

Case report 2: Correction of anterior crossbite using Fixed Z spring

A nine-year-old female child patient was referred to the clinic with a chief complaint of backwardly placed upper front right tooth. On intra oral examination, anterior single tooth crossbite was observed in maxillary left central incisor (Fig. 4). Fixed Z spring was planned and a written consent from the parents were documented. Banding was done on both the maxillary permanent first molars and alginate impressions of both arches were taken. A "U" shaped 19 gauge stainless steel wire was soldered to the palatal side of the bands adapted onto the upper molars extending anteriorly up to the rugae area. Z-Spring was fabricated from 23 gauge stainless steel wire. During fabrication, the active arm of the Z-Spring was kept at the buccal surface of the tooth so that when placed in patient's mouth, the spring is compressed on to the lingual surface of the tooth and activation could take place. The spring was incorporated and stabilized using an acrylic button similar to Nance button (Fig. 5). In order to gain adequate space for the movement of upper left central incisor GIC (3M Ketac™ Molar) bite blocks of 1.5 mm was given on lower primary second molars to open the bite. The patient was advised to maintain good oral hygiene. Soft food diet was suggested for the first few days after the cementation. Patient was recalled every week to open the coils and to clinically evaluate the progress of the treatment. The treatment continued for a period of 3 weeks. Following correction, 2 mm of over jet and overbite was achieved (Fig. 6). The patient was kept on follow up every 6 months.

Fig. 4: Pre-operative image 21 in crossbite.

Fig. 5: Intra operative image of the fixed Z spring appliance.

Fig. 6: Post correction of anterior crossbite w.r.t 21

DISCUSSION

We as dental practitioners have a major responsibility of incorporating adverse patterns of dental eruption in children.[5] One of the developmental problems frequently seen in the mixed dentition is the anterior crossbite. Anterior crossbite may be caused due to one or many etiological factors. If the cause is not identified, it may lead to anterior teeth mobility or fracture, abnormal enamel wear, TMJ disturbances and periodontal pathologies.[6]

The main goal of treatment is to tip the affected maxillary tooth or teeth labial to the point where a stable overbite and overjet relationship is obtained.[2]

Outlined herein are four factors to consider before selecting a treatment approach.[7-8]

1. Adequate space in the arch to reposition the tooth.
2. Sufficient overbite to hold the tooth in position following correction.
3. An apical position of the tooth in crossbite that is the same as it would be in normal occlusion.
4. A Class I occlusion molar relationship.

Early interception technique includes tongue blade therapy for the correction of developing anterior cross bite. In tongue blade therapy, the patient is advised to

bite on a tongue blade (Ice cream stick) during ease hours. The biting force is applied to the lingual aspect of the upper teeth to move the teeth in crossbite. Incisal edges of lower teeth act as a fulcrums to absorb the reciprocal ligual forces.

Patient cooperation is obligatory for successful treatment using tongue blade. However, it is impossible to predict the precise direction and magnitude of force generated by tongue blade. Reverse stainless steel crowns can also be successful, but there are several disadvantages such as poor aesthetic, the preparation of the inclined plane beforehand and poor patient compliance.[9]

For correction of developed anterior crossbite, removable appliances, inclined planes and fixed appliances are used. Removable appliances include anterior expansion screw, cranked cantilever spring, Z spring, which requires patient cooperation, hence fixed appliances are a better option.[10]

Main principle of expansion screw is that its ends are threaded in opposite directions and when it is turned the metal end plates move apart. Appliance is activated by a small amount of force at one time. The activation is done one-quarter turn which separates the acrylic plates by about 0.25 mm producing forces ranging from 3 to 10 pounds. This compresses the teeth in the socket by 0.12mm per side, which is within the width of Periodontal Ligament (0.25mm). Such a mild reduction of periodontal ligament space will not interrupt the blood circulation and creates an ideal condition for the tooth movement and bone transformation.[11]

More frequent adjustments of up to one-quarter turn twice a week is sometimes possible. But care must be taken not to overdo it as this can ill fit the appliance. Frequency of opening the screw is twice a week in children and in adults once a week. As the acrylic base plate stays firm, measure of wanted movement of the teeth can be controlled by screw. Some advantages of this appliance are easier to manage, more stability, forces can be well controlled, activation can be done by patients with a key, and as the appliance is fixed hence lesser tendency to dislodge.

Z spring is the most frequently used appliance for minor anterior crossbite treatment. The springs are activated to exert labial forces to move the maxillary incisors. This appliance is known to deliver slow-light continuous forces.

Fixed Z spring is a safe, economical, fast and simple option for the correction of crossbite. It is economical as it doesn't include the utilization of fixed orthodontic treatment methods, hence this was selected as one of the treatment options. The fixed approach results in significantly less tooth tipping by offering a more bodily tooth movement and provides a continuous force. And fixed z spring appliance gives rapid crossbite correction with no damage to the affected teeth or associated periodontal tissues.

The enamel surface post operatively was polished, and topical fluoride (Acidulated phosphate gel) gel application was done to both cases.

CONCLUSION

Early diagnosis and correction of anterior cross bite is very important to prevent any adverse effects upon the growth and development of the child. These two fixed appliances which are novel, simple and cost effective can be considered, as these methods don't damage the teeth or the periodontium and shows a quick result.

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