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RESEARCH ARTICLE

Correction of a Single Tooth Anterior Dental Crossbite using a Fixed Z-Spring: A Series of Three Cases

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Abstract

Anterior dental cross bites are one of the most common orthodontic problems that we observe in growing children. Removable appliance with Z' spring is the most prescribed method of correction of these cross bite. But most of the children do not prefer to wear removable appliances and thus compliance becomes an issue. So we decided to use fixed Z' Spring to obtain better patient cooperation and acceptance. Presented in the article is a case series, consisting of 3 case reports in which anterior cross bite is corrected successfully with the fixed appliance.

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Introduction

Anterior dental cross-bite is described as one or more upper teeth erupting lingual in relation to the lower teeth with which they should occlude when the mandible is in maximum intercuspation (Sarver et al, 1972). If not corrected immediately, it may lead to abnormal enamel abrasion of the lower incisors, dental compensation of mandibular incisors leading to thinning of labial alveolar plate with gingival recession, mobility, fracture of tooth, periodontal pathosis and temporomandibular joint disturbance (Lee, 1978), (Valentine et al, 1970), (Estreia et al, 1991). As clinicians, our ultimate goal must be to achieve a rapid and stable correction of these malocclusions.

The interception of dental anterior cross-bite is easier at early stages of occlusal development (Sarver et al, 1972), (Sim, 1977).

Various treatment modalities to correct these malocclusions have been advocated. These include tongue blade therapy, reverse stainless steel crowns, removable Hawley retainer with anterior Z-springs and bonded resin composite slopes, Bruckl appliance and Clear Aligner. Fixed appliances such as 2x4 appliances can also be used (Dwijendra et al, 2011).

Z' springs or double cantilever springs are routinely recommended for correction of anterior dental crossbite. Since they are fabricated with Hawley's retainer, most of the children either loose them or are not cooperative to wear them. In the present case series, we have presented three cases of anterior dental crossbite that have been corrected using a fixed Z-Spring appliance. The current available literature lacks any data regarding its use. This is a modification to a conventional Z- spring with Hawley's appliance. Here, the spring is soldered to a wire that is inturn soldered to the bands on the molars, which provides stability to the appliance.

Case Reports

Case 1 (Fig 1and 2)

A ten year old female patient reported to the department with the chief complaint of one upper front tooth in abnormal position than the corresponding teeth. The patient had no significant past medical and dental history. Extra oral examination revealed normal profile with competent lips. Intra oral examination revealed Angle's Class I molar relation bilaterally and permanent upper right lateral incisor in crossbite with adequate space for crossbite

correction. The patient refused to wear removable Z spring appliance with Hawley's retainer. So, the correction of the crossbite was carried out using a fixed Z-Spring.

The details of the fixed Z spring is as follows:

A "U" shaped 19 gauge wire is soldered to the palatal side of the bands adapted onto the upper molars extending anteriorly upto the rugae area. The tooth in crossbite on the model is cut at the level of point of contact of the spring. Z-Spring is fabricated from 23 gauge wire. During fabrication the active arm of this Z-Spring is kept at the buccal surface of this cut tooth, so that when placed in patient's mouth, the spring is compressed and activation can take place. This spring is soldered onto the palatal arch and stabilized using an acrylic button similar to Nance button. A composite button is built at the incisal edge of the tooth and acts as a stabilizer for the spring. The bite is opened by placing bite blocks on the posterior molars using Resin Modified Glass Ionomer Cements (GC Corporation) so as to achieve a 2 mm incisal clearance. The appliance is cemented on the upper permanent molars using Zinc Polycarboxylate cement (Poly F, Dentsply).

Activation was carried out in both helices simultaneously by opening the helices 2 mm each time twice. The patient was followed up for four weeks following which correction of the crossbite was achieved. No retention was provided as adequate over jet and overbite had been achieved.

Case 2 (Fig 3)

A nine year old female patient reported to the department with the chief complaint of mild crowding of teeth. On examination the patient had a lingually erupted permanent upper right lateral incisor with flared central incisors and midline spacing. The patient had no significant past medical or dental history. On extra oral examination, normal profile with competent lips was seen. Intra oral examination revealed Angle's Class I molar relation. Following space analysis adequate space was found available for the permanent dentition. Thus, the current treatment plan was to correct the crossbite and retain the available space.

A fixed double cantilever spring was used to correct the crossbite. Activation of the Z- spring was carried out three times and in 6 weeks the correction of the crossbite was attained. Later the Z- spring was removed and the appliance was retained as a Nance palatal arch space maintainer in order to prevent further space loss due to late mesial shift of the upper 1st Molars.

Case 3 (Fig 4)

The third case was of a nine year old female patient who reported to the department with the chief complaint of rotated upper right lateral incisor. The patient had no significant past medical and dental history. On extra oral examination, normal profile with competent lips was seen. Intra oral examination revealed Angle's Class I molar relation bilaterally. In addition to being rotated the lateral incisor's mesial edge was in cross bite. A fixed double cantilever spring similar to Case 1 was used to correct the crossbite. Activation of the Z-spring was done twice and in five weeks the correction of the crossbite was achieved.

Discussion:

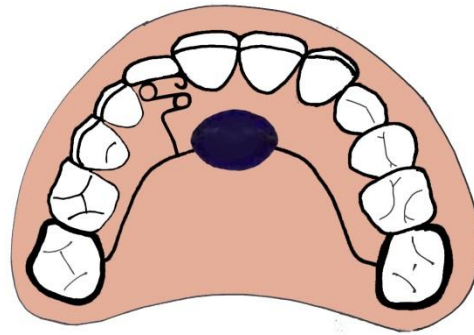
An important factor to consider in orthodontic treatment is whether to use a removable or a fixed appliance. Treatment involving removable appliances will ensure maintenance of good oral hygiene (Bhalajhi, 2006). They reduce chairside time during treatment as they are fabricated in the laboratory. However chances of breakage, losing the appliance and need for good cooperation from patients and supervision of parents are some of the drawbacks (Bell et al, 2011).

With regards to fixed therapy, the advantages over removable type of appliance are significant and includes lesser bulk, lesser chairside time, bodily tooth movement, better control, and lesser treatment time needed. However, they increase the chair side time needed and require specialized training (Bhalajhi, 2006).

In this case, a fixed double cantilever spring was used. The advantage of the presented appliance includes that it has the mechanics of removable spring and the advantages of the fixed appliances. Increased stability and rigidity of the fixed anchorage system dramatically enhances directed forces towards the centre of rotation of the engaged incisors. The fixed approach results in significantly less tooth tipping by offering a more bodily tooth movement and provides a continuous force (Buckley, 1972).

The composite button on the incisal edge helps to stabilize the spring and prevents it from slipping away from the incisal edge.

Fig 1: Design of the fixed Z' spring.



**Fig2: A. Case showing upper right lateral incisor in cross bite.
 B. Fixed Z'spring in place
 C. Post treatment**



**Fig3: A. Case showing upper right lateral incisor incross bite.
 B. Fixed Z'spring in place
 C. Post treatment**



**Fig4: A. Case showing upper right lateral incisor incross bite.
 B. Fixed Z'spring in place
 C. Post treatment**



Conclusion

The presented method for correction of crossbite provides a novel method that balances the advantages of removable and fixed treatment modalities and its further use can be recommended for correction of anterior dental crossbites.

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