



## Different Techniques for Correcting an Anterior Crossbite: A Case Series

**Sampada Kaul, Nikhil Srivastava, Vedant Kansal and Sakshi Rawal**

Department of Pediatric and Preventive Dentistry, Subharti Dental College and Hospital, Swami Vivekananda Subharti University, Meerut, UP, India

\*Corresponding Author: Sampada Kaul, Email: sampadaonline@gmail.com

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### Abstract

Anterior crossbites in early mixed dentition can be transferred from primary to the permanent dentition and have long-term deleterious effects on the growth and development of a child's teeth and jaws, thus requiring early and immediate treatment. Early age orthodontics can simplify and also eliminate the need for later complex treatment procedures. Furthermore, relapse of treatment is rare hence retention is not necessarily required, thus necessitating proper interceptive treatment at early stages. Various treatment modalities, either removable or fixed in nature, have been discussed to correct this malocclusion.

**Keywords:** Anterior Crossbite; Interceptive orthodontics; Mixed Dentition; Pediatric Dentistry

### Introduction

One of the most prevalent oral conditions in children is malocclusion, which has undesirable consequences on the masticatory function, craniofacial development as well as the facial appearance. It is a pediatric dentist's or orthodontist's major responsibility to guide the developing dentition to a state of normalcy [1]. Several studies have revealed that a substantial number of malocclusions occur during the mixed dentition period [2-4]. However, it is during this transition period that there is the greatest opportunity for occlusal guidance and prevention of malocclusion with minimal interception only [5]. Among the problems most frequently seen in the mixed dentition period, is the anterior cross bite.

Anterior crossbite is defined as a malocclusion resulting from the lingual positioning of the maxillary anterior teeth in relationship to the mandibular anterior teeth and can be either dental or skeletal in origin [6]. With a reported incidence of 4-5%, anterior dental crossbite is usually the result of palatal malposition of the maxillary incisors resulting from a lingual eruption path; trauma to primary maxillary incisors resulting in lingual displacement of permanent tooth buds; presence of supernumerary anterior teeth; over retained deciduous tooth or root; odontomas or crowding in incisor region [7].

If left untreated, it may result in abnormal enamel abrasion of the lower incisors, dental compensation of the mandibular incisors

leading to thinning of the labial alveolar plate, tooth mobility, fracture, gingival recession and periodontal pathosis [8]. Interception of dental crossbites is easier at early stages of occlusal development. Interceptive procedures not only simplify but eliminate the need for later complex treatment procedure, their most important advantage of being that majority of the malocclusion can be corrected without a surgical intervention or extraction of permanent teeth [9].

Various treatment modalities to correct these malocclusions have been advocated. The present case report illustrates three different cases of anterior crossbite in early and late developmental stages which were managed by using removable acrylic appliance with an expansion screw, modified fixed Z-spring appliance and fixed 2 x 4 Appliance with stainless steel wire bending.

### Case Reports

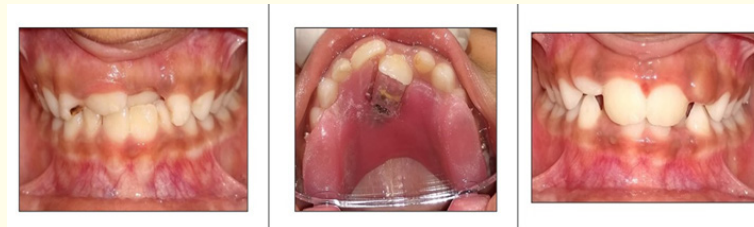
#### Case 1

A 6-year-old female patient was referred to the department of Pediatric and Preventive dentistry with the chief complaint of an unaesthetic appearance of the erupting left maxillary central incisor (Figure 1A). Her medical and dental history were non-contributory, and the patient did not have a family history of Class-III malocclusion. Extraoral examination revealed normal profile with competent lips. Primary maxillary lateral incisors were still pres-

ent. The patient was in early mixed dentition and had a Class-I molar relationship on both sides and an overjet of 2 mm. The overbite was 100% on the left maxillary central incisor. Radiographic evaluation showed no evidence of bone or dental pathology.

To correct the crossbite, a removable acrylic appliance with a labiolingual expansion screw and posterior bite planes was used (Figure 1B). The patient was advised to activate the jackscrew in the appliance by 0.25 mm (quarter turn) every al-

ternate day, wear it throughout the day but remove it while eating. It was also recommended to brush her teeth and appliance after every meal in order to promote good oral hygiene. After 2 months, the maxillary and mandibular incisor displayed an edge-to-edge relationship, while the crossbite was corrected in an additional 4 months (Figure 1C). During the course of treatment (at 6 months), the permanent maxillary lateral incisors began erupting in normal occlusal relationship with the lower anterior teeth. No retention was provided as adequate over jet and overbite had been achieved [10].



**Figure 1:** Crossbite correction with removable appliance including expansion screw (1A: Preoperative image; 1B: Intraoperative image with appliance; 1C: Postoperative image).

**Case 2**

A 6-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, dental and family history. Extraoral examination revealed normal profile with competent lips. Intra oral examination revealed Class I molar relation bilaterally and permanent upper right central incisor in crossbite (Figure 2A). The patient as well her parents were neither in favour of a removable appliance nor fixed 2 x 4 appliance due to esthetic concerns. So, the correction of the crossbite was carried out using a Z-Spring incorporated in fixed Nance Palatal space maintainer (Figure 2B).

**The Z spring appliance was modified as follows**

A Nance Palatal space maintainer was fabricated with its characteristic “U” shaped 19-gauge wire soldered to the palatal side of bands adapted onto the permanent maxillary molars, extend-

ing anteriorly up to the rugae area. Z-Spring was fabricated from 23-gauge wire to correct the tooth in crossbite [11]. During fabrication, the active arm of the Z-Spring was kept at the buccal surface of 11, so that on insertion in patient’s mouth, the spring gets compressed and activation could take place. The spring was soldered onto the palatal arch and stabilized using the acrylic Nance button. A composite button was then built at the incisal edge of the tooth which acts as a stabilizer for the spring.

The appliance was luted on the molars using Type I Glass Ionomer Cement. Activation was carried out in both helices simultaneously by opening the helices 2 mm each time. The patient was followed up for 2 months following which correction of the crossbite was achieved (Figure 2C). No retention was provided as adequate over jet and overbite had been achieved.

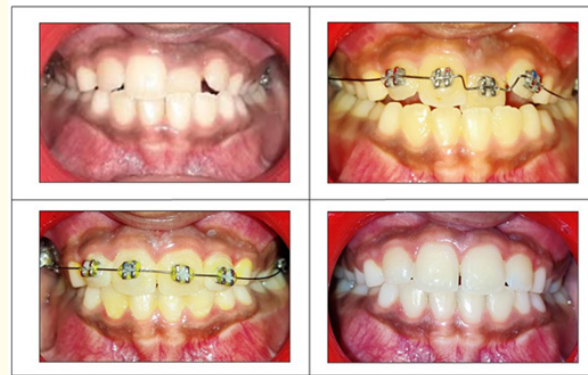


**Figure 2:** Crossbite correction with Z-spring appliance (2A: Preoperative image; 2B: Intraoperative image with appliance; 2C: Postoperative image).

**Case 3**

An 8-year-old female patient reported to the department with a chief complaint of irregularly placed upper front teeth for 2 years. There was no significant family, medical and dental history. Extra oral examination revealed a straight profile while the intra oral examination revealed a U-shaped arch with Class I molar relationship bilaterally and left maxillary central incisor palatally placed with respect to lower incisors (Figure 3A). After discussing all treatment options, the parents opted for the 2x4 fixed orthodontic treatment for a definite result.

Treatment was initiated by cementing stainless steel orthodontic bands with buccal tubes on permanent first molars bilaterally. Metal brackets MBT with a 0.022" slot was bonded on the labial aspects of the four maxillary permanent incisors. For initial correction of the crossbite, a 0.012" round stainless-steel arch wire along with the incorporation of a first order bend was used for 21 days following which crossbite was corrected (Figure 3B). Further alignment was done using 0.012" followed by 0.014" NiTi arch wire (Figure 3C). Results were achieved in 6 weeks (Figure 3D). Due to adequate overjet and overbite, the retention phase was then discontinued after 6 weeks.



**Figure 3:** Crossbite correction with 2 x 4 appliance with ss wire bending (3A: Preoperative image; 3B: 2 x 4 Appliance with 0.12" Stainless Steel wire bending; 3C: 2 x 4 Appliance with 0.12" NiTi wire for alignment; 3D: Postoperative image).

**Discussion**

Anterior crossbites in the early mixed dentition are believed to be transferred from the primary to the permanent dentition and can have long-term effects on the growth and development of the teeth and jaws.<sup>11</sup> While anterior dental crossbites originate from

the abnormal axial inclination of the maxillary anterior teeth, anterior skeletal crossbites are most often associated with a skeletal problem, such as mandibular prognathism and midface deficiency [7].

Anterior dental crossbite thus require early and immediate treatment. The main goal of treatment is to tip the affected maxillary tooth or teeth labially to the point where a stable overbite relationship exists. Relapse is usually prevented by the normal overjet/overbite relationship that is achieved; hence retention is not necessarily required [10].

An important factor to consider in orthodontic treatment is whether to use a removable or a fixed appliance. On one hand, removable appliances ensure maintenance of good oral hygiene [12] and reduce chairside time during treatment as they are fabricated in laboratory. However, chances of breakage, losing the appliance, need for good cooperation from patients and supervision of parents are some of the major drawbacks.[13] On the other hand, with fixed therapy, the advantages over removable appliances include lesser bulk, bodily tooth movement, better control, and lesser overall treatment time needed. However, they increase the chair side time needed and require specialized training [12].

In the first case, with regard to the bite plane, specific thickness of acrylic and amount of tooth separation is extremely important as increased and unnecessary amounts of bite opening may lead to alteration of the vertical relationship and patient's decreased compliance. In the present case, an acrylic thickness of 4 mm was specified which was barely enough to disengage the anterior crossbite tooth [11].

In regard to the expansion screw, generally, the recommended activation frequency is every second or third day [14]. In this case, we followed an alternate day activation protocol, which was found to be effective in the management of this case. Many studies recommend activation twice a week [15] and even once a week [16].

In the second case, a fixed double cantilever spring was used along with a nance palatal space maintainer. This appliance had the mechanics of removable spring, advantages of a fixed appliance and an added bonus of arch stabilization in the transition period. Increased stability and rigidity of the fixed anchorage system dramatically enhanced the forces directed towards the centre of rotation of the engaged incisor, resulting in significantly less tooth tipping by offering a more bodily tooth movement. The composite button on the incisal edge further stabilized the spring and prevents its slippage from the incisal edge. This method thus repre-

sents a safe, quick, easy, and esthetically acceptable alternative for the correction of anterior dental crossbite [11].

However, both the above methods require a laboratory phase, which increases the price of treatment.

Lastly, in the third case, the 2 x 4 appliance given is versatile, easy to use and well tolerated by patients. While selecting this appliance, the eruption of permanent molars and incisors is an important consideration. Thus, it can be considered a partial fixed orthodontic treatment during the early stages to correct malocclusions which are common during the mixed dentition period. Although greater chairside time was required for placement of appliance, there was no laboratory cost involved as with the above two cases. Advantages of this appliance include-bodily movement of teeth if space needs to be created for an in standing incisor or recreated for an impacted late erupting incisor, torque of the incisor roots palatally to decrease the chance of relapse, as well as maximize the aesthetic result by efficient and effective de-rotation of incisors. The functional improvement coupled with the obvious psychological benefit gives this simple and easily placed appliance a significant advantage over the traditional method of treating potentially challenging mixed dentition malocclusions [9].

The major disadvantages of using the 2 x 4 appliance during the early mixed dentition stage is the placement of the molar band, which could be a problem if the permanent molar has not fully erupted or has a short clinical crown height. At times, the band could also cause discomfort. Furthermore, as the brackets are only bonded to the permanent incisors, a long span of arch wire extends from the molar bands to the incisors which could be a problem to young patients especially during eating and brushing as the wire dangles and could easily come out from the molar tube. Plaque retention around the bands and brackets is yet another major concern which could however be easily overcome with good oral hygiene care [17].

## Conclusion

In the present case series, the least amount of time for correction of the crossbite was taken by 2x4 appliance while the removable appliance took the most. The maximum esthetic satisfaction and comfort was seen with the Z-spring appliance; however, the patient did complain of mild discomfort every time the spring was

activated. However, all three treatment modalities fared well in terms of correction of the crossbite and were well accepted by the patients. The final decision of selection of treatment type thus depends on patient and parental requirement and compatibility and clinicians training.

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