

Fixed Appliance with Expansion Screw for the Treatment of Primary Anterior Crossbite

SANCHIT PAUL¹, ASHWIN RAO², PAUL CHALAKKAL³, SARANYA MONY⁴

ABSTRACT

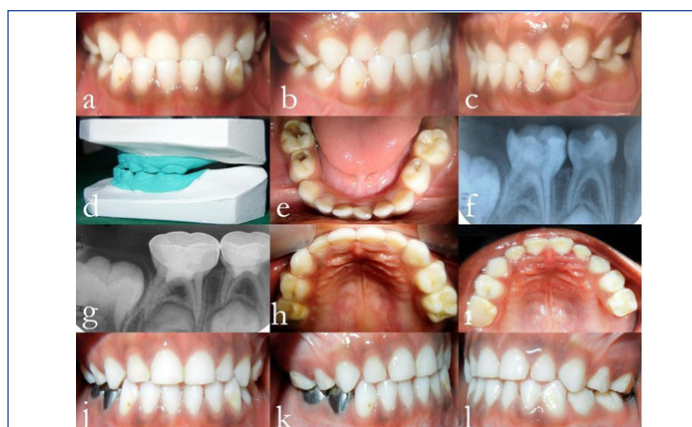
Anterior crossbite occurring during the primary dentition stage needs immediate correction so that functional, aesthetic and skeletal complications may be avoided in the future. This article describes a fixed appliance with an expansion screw that was successfully used for the treatment of primary anterior crossbite. Crossbite correction was achieved in about six weeks. A detailed description with regard to fabrication of the appliance has also been discussed.

Keywords: Dento-alveolar cross bite, Early correction, Fixed orthodontic treatment, Jack screw, Mandibular prognathism

CASE REPORT

A four and half year old boy reported to the Department of Pedodontics & Preventive Dentistry (Manipal College of Dental Sciences; Manipal University) with the complaint of protruding lower teeth. On extra oral examination, the boy had a well balanced and symmetrical facial profile. However, on intraoral examination, an anterior reverse overjet was observed (Table/Fig-1a, 1b and 1c). There was no history of palatal eruption of maxillary incisors, supernumerary teeth/odontomas, crowding in the incisor region, abnormal lower anterior tongue position, upper lip biting or any other habit. Therefore, deficient maxillary growth or mandibular prognathism was considered as the etiology for the Primary Anterior Crossbite (PAC). Study models were prepared, and it was found that the maxillary and mandibular second molars were in mesial step relationship, bilaterally [Table/Fig-1d]. In the lower arch, 84 and 85 had occlusal caries with symptoms associated with reversible pulpitis, while 74 had occlusal caries that was asymptomatic [Table/Fig-1e]. An intraoral radiograph of 84 and 85 revealed caries almost extending to the pulp with no periapical manifestations [Table/Fig-1f]. Pulpotomies were performed on 84 and 85 followed by stainless steel crown placement on the same appointment day [Table/Fig-1g]. In the upper arch, occlusal caries

was found on 55 and 65 [Table/Fig-1h] which were restored with glass ionomer cement [Table/Fig-1i]. A reverse overjet of 2mm was measured anteriorly, while the vertical overbite was about 1/3rd of maxillary anterior crown heights. It was decided to use a fixed appliance with an expansion screw for correcting the PAC. Consent was obtained from the patient prior to all treatment procedures. The appliance [Table/Fig-2] consisted of molar bands on 55 and 65 that were soldered to a stainless steel arch wire similar to a Nance palatal arch. In the anterior region, an expansion screw was fitted that divided an acrylic plate into two segments (anterior and posterior). The anterior segment spanned from 52 to 62, contacting these teeth at their palatal surface, extending beyond the occlusal plane by 2mm. The screw was fitted such that its activation would lead to movement of the anterior acrylic segment forwards; thereby pushing the maxillary anteriors forwards in order to correct the PAC. The anterior acrylic segment also functioned as an anterior bite plane, such that the lower anteriors would remain out of occlusion to enable reverse overjet correction. The screw was activated by a quarter turn every four days and PAC correction was achieved in about six weeks [Table/Fig-1j, 1k, 1l].



[Table/Fig-1a]: C1a: Anterior view showing crossbite. **[Table/Fig-1b]:** Right lateral view showing crossbite. **[Table/Fig-1c]:** Left lateral view showing crossbite. **[Table/Fig-1d]:** Lateral view of study models in occlusion showing anterior crossbite. **[Table/Fig-1e]:** Mandibular occlusal view. **[Table/Fig-1f]:** Radiograph showing 84 and 85. **[Table/Fig-1g]:** Radiograph showing 84 and 85 after the completion of pulpotomies and stainless steel crown placement. **[Table/Fig-1h]:** Maxillary occlusal view. **[Table/Fig-1i]:** Maxillary occlusal view after restoring 55 and 65. **[Table/Fig-1j]:** Anterior view after crossbite correction (after six weeks). **[Table/Fig-1k]:** Right lateral view after crossbite correction. **[Table/Fig-1l]:** Left lateral view after crossbite correction.



[Table/Fig-2]: Maxillary occlusal view showing fixed appliance with expansion screw.

DISCUSSION

Anterior crossbite is defined as a malocclusion resulting from the lingual positioning of the maxillary anterior teeth in relationship to the mandibular anterior teeth [1]. Patients with PAC are classified into two groups: subjects in whom it spontaneously normalizes during the mixed dentition period, and those in whom it proceeds to a reversed skeletal occlusion [2]. PAC requires early correction for functional and aesthetic reasons. If delayed, PAC can lead to

skeletal Class III malocclusion, which would be possible to treat only with combined orthodontic and orthognathic methods [3,4]. Anterior crossbite has an incidence of 4-5 % and may become evident during the early mixed dentition period [5]. It has been reported to originate from various factors: palatal eruption of maxillary incisors; trauma to the primary incisor or the presence of an over-retained primary or supernumerary tooth/odontomas resulting in lingual displacement of the permanent tooth germ; crowding in the incisor region; upper lip biting habit [6]. However, none of these factors were found to be present or previously reported in the patient. Deficient growth of the maxilla or mandibular prognathism [7] and abnormal tongue position (lower anterior) [8] are additional factors that may result in PAC. Abnormal dental features had been found to be the fourth most common reason for teasing, however, comments pertaining to teeth were considered to be the most hurtful for children between eight and 10 years of age [9]. The lower jaw should be accessed in centric occlusion as well as in edge to edge relationship. If it is possible to bite in edge to edge relationship, it means that the PAC is of dento-alveolar origin [3]. A similar finding was observed in our patient, which helped us to confirm it to be a case of dental crossbite alone, without any skeletal component. Moreover, the patient had a well balanced and symmetrical facial profile. A lateral cephalogram could not be obtained before the procedure, due to lack of compliance and excessive movement, since the patient was only four and half years old.

The various treatment modalities used to correct anterior dental cross bite include the use of tongue blades, reversed stainless steel crowns, fixed inclined planes, bonded resin-composite slopes, quad-helix and removable acrylic appliances incorporating finger springs [4]. PAC with vertical over bite of less than half the crown length may be treated using an upper plate with protraction springs or an expansion screw, however, a vertical overbite of half to two-third of crown length would necessitate the use of a functional appliance incorporating an inclined plane [10]. The Bruckl appliance is a removable functional appliance for the lower arch, which utilizes a Hawley's retainer and an inclined plane. The movement of teeth (proclination of upper incisors and intrusion of lower incisors) occurs from the resulting force of closing muscle and inclined plane interaction. The force increases with steepness of the plane, however, an angulation of 45 degrees is advised. It is also possible to add acrylic teeth if necessary for use as a removable partial denture. Treatment usually gets completed in about 7-8 weeks [11]. Chin caps suppress antero-inferior growth of the mandible by rotating the mandible posteriorly, decreasing the mandibular angle [12]. However, problems such as rebound after cessation of use and excessive load to the temporomandibular joint have been reported [13]. The Yanagisawa Class III (YC3) shield was developed to elevate tongue position, which is believed to be a cause for PAC [8]. It brings about elevation of the tongue and

uses tongue pressure to bring about change in its position (antero-inferior to postero-superior). The YC3 also moves the upper lip and resists forces from the buccinator muscle, facilitating growth of the maxilla and improves labial inclination of maxillary anterior teeth [2]. Considering the child's age, fixed appliance therapy was preferred since they have advantages such as little discomfort (better patient compliance); limited need for cooperation from the patient and better control of tooth movements. Moreover, fixed appliances are generally preferred for expansion, due to reduced cost and treatment time [14]. No retention appliance was placed after anterior crossbite correction was achieved, since crossbite corrections do not generally need a retention appliance. Moreover, long term follow up could not be undertaken, since the patient never returned following crossbite correction.

CONCLUSION

A fixed appliance utilizing an expansion screw is an effective treatment option for PAC. However, the clinician must have sufficient knowledge with regard to the indications, advantages and disadvantages of all the appliances used for treating PAC in order to decide upon which appliance is to be used at any particular situation.

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PARTICULARS OF CONTRIBUTORS:

1. Senior Lecturer, Department of Pedodontics and Preventive Dentistry, I.T.S. Dental College and Hospital, Greater Noida, India.
2. Associate Professor, Department of Pedodontics and Preventive, Dentistry, Manipal College of Dental Sciences, Manipal University, Mangalore, India.
3. Assistant Professor, Department of Pedodontics and Preventive Dentistry, Goa Dental College & Hospital, Goa, India.
4. Consultant, Chandra's Little Smiles, Coimbatore, Tamil Nadu, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Paul Chalakkal,
Assistant Professor, Department of Pedodontics and Preventive Dentistry, Goa Dental College & Hospital, Goa – 403202, India.
E-mail : atomheartpaul@yahoo.com

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