Early Treatment with the ALF Functional Appliance

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Abstract: *The aim of this study is to report five cases of children treated with an interceptive technique utilizing ALF (Advanced Light Force) functional orthodontic appliances in anterior and/or posterior cross bites in primary and early mixed dentition.*

Keywords: ***ALF;Crossbite correction;primary dentition;early mixed dentition;posterior unilateral crossbite correction;posterior bilateral crossbite correction;anterior crossbite correction;snoring;narrow airway;facial asymmetry***

Introduction

A cross bite occurs in 7-17% of young children. Cross bites are can be posterior unilateral, posterior bilateral, or anterior. Posterior cross bites of dento-alveolar origin, a transverse discrepancy of the maxillo-mandibular relationship, are one of the most common malocclusions in the primary and mixed dentition. Cross bites in young children are often indicative of potential or actual mandibular facial asymmetries.[2] Consequently, the ideal time to correct a cross bite is as early as detected and in the primary dentition phase, if possible.[3,4] In anterior cross bites, the masticatory pattern of protruding the mandible and jumping into cross bite becomes fixed in the brain by about age 4.[5,6,7] Posterior cross bites that are left untreated in early childhood can lead to asymmetries in the temporo-mandibular joint (TMJ) and mandible.[1,8,9,10] Muscular imbalance in a unilateral cross bite situation encourages the mandible to become significantly longer on the non-cross bite side.[5,11] When a cross bite is found in the primary dentition and allowed to carry over into the permanent dentition, it is more difficult to treat.[12,13] However with early diagnosis and early interceptive treatment with the ALF functional appliance, it is possible to obtain the proper skeletal and dental alignments. The ALF appliance was developed by Dr. Darick Nordstrom in 1982 with input from osteopathic physicians, the purpose was to design an orthodontic appliance with a focus on cranial rhythm and movement, a "cranial friendly" approach.[14] The purpose of these case reports is to demonstrate the efficacy of the ALF appliance in the corrective treatment of cross bites in the primary and early mixed dentition.

Methods Materials

We describe five cases involving children in primary or early mixed dentition (mean age = 6 years) who had one or more types of dental cross bite. In each case, we carried out a full orthodontic work up that included the following: a medical and dental history, a thorough clinical evaluation, intraoral and extraoral photographs, diagnostic models of the teeth and gums, and a 3D cone beam CT scan (i-CAT). During the history the parents reported incidents of snoring, tooth grinding, and mouth breathing. In addition to the cross bites, the clinical evaluation revealed a class III tendency, facial asymmetry, cervical displacement, narrow airways, large tonsils in four cases, and an anterior tongue thrust or low tongue posture in all five cases. Each case was referred to an Osteopath for periodic osteopathic evaluation and an Oral Myologist for orofacial muscle toning and reeducation.

The ALF appliance was chosen in these five cases because each child had a myofunctional tongue posture problem, the ALF has minimal bulk, and the strategic placement of the omega loops encourages normal tongue oral rest posture position, instead of further impeding tongue placement as a conventional rapid palatal expander (RPE) would do. In addition, the light elgiloy wire does not over power the cranial mechanism as a screw driven conventional rapid palatal expander (RPE) or traditional fixed mechanics can do, and the ALF is a more comfortable appliance that doesn't tend to interfere with speech.

Using the workup findings, we designed an ALF appliance for each patient with an .025 yellow eligloy body wire; The cribs, and crescents were fabricated from .022 yellow eligiloy wire and soldered with a gold solder. The configuration utilized was three omega loops, two posterior loops and one anterior loop with crescents on the cuspids and cribs and crescent claps on the primary second molars. It should be noted that the ALF design specifically avoids restricting the premaxilla and palantine bones.[15] The basic ALF design usually cribs the molars, but activation places force vectors through the cuspid and premaxillary sutures, these in turn open the premaxilla releasing the maxillary and premaxillary sutural restrictions, and reducing the forces necessary to develop the maxillae. The

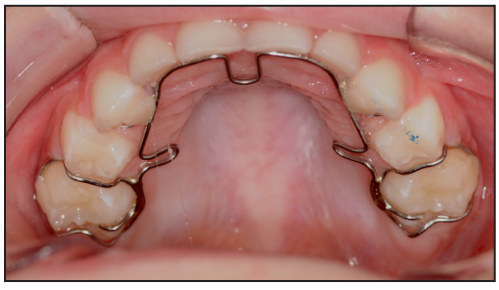


Figure 1: ALF for treatment in Primary Dentition.

ALF's use of composite ledges to selectively stabilize the body wire makes it a "fixed-removable" type appliance and facilitates force couples that increase tooth movement and enhance cranial motion.[14] The boundary between the premaxilla and maxilla can be discernible up to 5-years-of-age.[16]

At the delivery appointment(first post-workup visit), we passively seated and then retained the ALFs in the mouth using bonded resin composite ledges on the buccal surfaces of the second primary molars (E's) and the lingual of the primary canines (C's). Composite pad build ups just high enough to disclude the bite and clear the cross bite were placed on the mandibular first primary molars. This was done to allow the first molars to erupt into the proper position stabilizing the mandible.[12,13,17]

We scheduled the follow-up appointment (second visit) for four weeks after the delivery appointment. At that visit we removed, cleaned, and activated the ALF appliance's anterior omega loop using a bird beak light wire plier. This activation creates a slight forces in a transverse direction with emphasis in the direction of the posterior cross bite, if the cross bite is unilateral, or equal emphasis if a bilateral cross bite is present. We then reinsert the ALF to engage the previously placed composite ledges and scheduled another four week follow-up appointment.

At the third visit (4 weeks later) we removed and cleaned the ALF and further activated it, again in the anterior omega loop following the same technique as in the previous appointment. At this visit we additionally activated the posterior omega loops, bilaterally in the case of anterior cross bites. The bird beak light wire pliers were used to open the posterior omega loops.

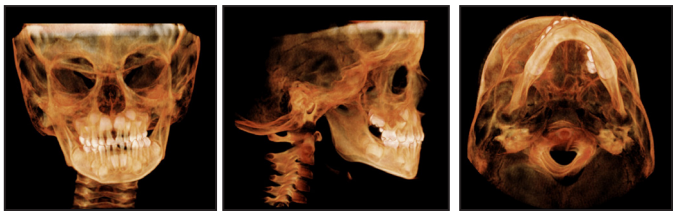
The fourth and later visits followed the same protocol as the third visit. At each follow-up visit, we continually monitor growth and development in both the transverse dimension (anterior omega loop) and anterior-posterior dimension (posterior omega loops). For each case, we continued this sequence for several months until the cross bites cleared.

Case1: Left side posterior cross bite with an anterior component in the primary dentition of a 5 year old male.

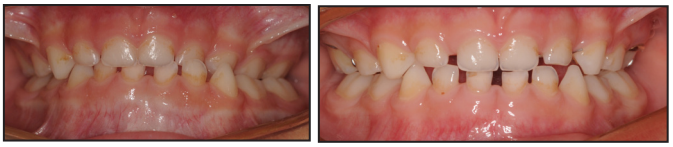
Case2: Anterior Cross bite in Early Mixed Dentition in a 6-year-old male.

Case 3: Right Posterior and Anterior Cross bite primary dentition in a 5-year-old female.

Case 1: Left side posterior cross bite with an anterior component in the primary dentition of a 5-year-old male.

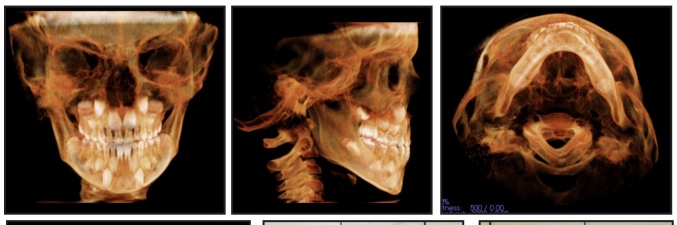


Decreased airway | Before treatment | 8 months into treatment

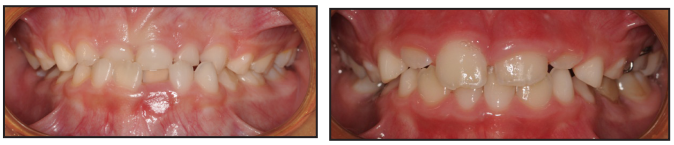


Before treatment | 8 months into treatment

Case 2: Anterior cross bite in mixed dentition in a 6-year-old male.

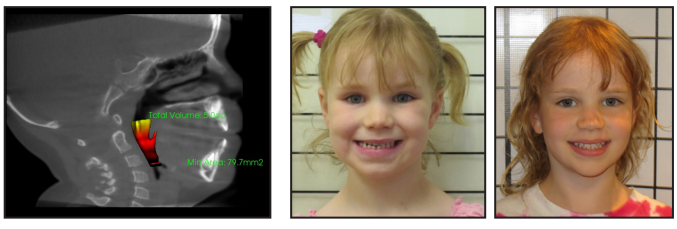


Decreased airway | Before treatment | 15 months into treatment

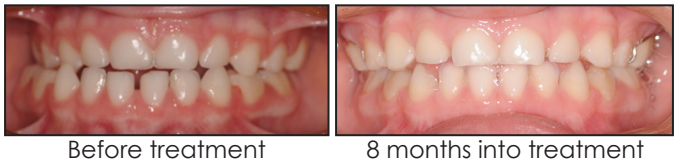


Before Treatment | 15 months into treatment

Case 3: Right posterior and anterior cross bite in primary dentition in a 5-year-old female



Decreased Airway | Facial asymmetry | 8 months into treatment

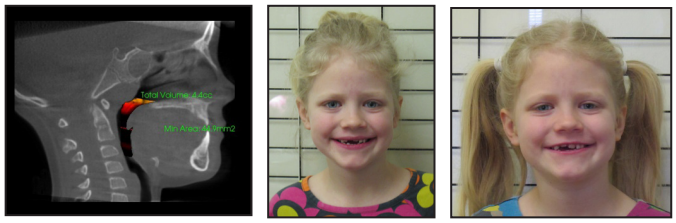


Before treatment | 8 months into treatment

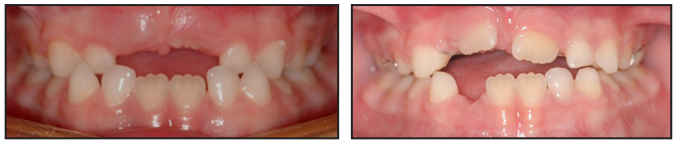
Case 4: Anterior Crossbite in Early Mixed dentition in a 6-year-old female.

Case 5: An anterior and posterior cross bite in Early Mixed Dentition of a 6-year-old female.

Case 4: Anterior cross bite in the primary dentition of a 7-year-old female

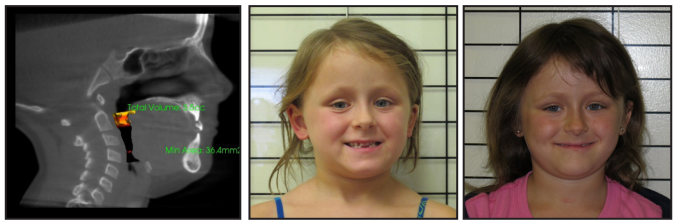


Decreased Airway | Before treatment | 3 months into treatment

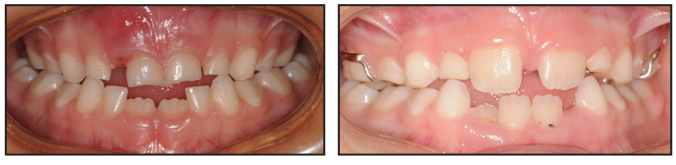


Before treatment | 3 months into treatment

Case 5: Anterior and posterior cross bites in a 6-year-old female in early mixed dentition.



Decreased airway | Before treatment | 5 months into treatment



Before treatment | 5 months into treatment

Results

In all five cases, we diagnosed the cross bites at an early stage of growth and development and promptly initiated treatment with ALF appliances. All five children experienced favorable results in the correction of the cross bites using the ALF appliance as an interceptive appliance in the primary and early mixed dentition. In addition, whereas the baseline iCAT evaluation had revealed narrow airways, class III growth tendency, and cervical displacement in each case, the mothers of all the cases reported cessation of snoring and improved nasal breathing at night. Moreover, the photographic follow-up evidence indicates an improvement in midline discrepancy, head posture, and facial symmetry (see cases 1-5).

Conclusion

The ALF (advanced light force) appliance is effective for the correction of cross bites in primary and early mixed dentition cases. All five of our young cases demonstrated cross bite correction, facial symmetry improvement, and cervical posture improvement. Myofunctional retraining regimes have been recommended to the parents to maintain the corrections and continue to tone the orofacial musculature.[18] The parents reported an improvement in pretreatment snoring which may indicate that the ALF appliance could be an efficient appliance in the treatment of pediatric sleep disorder breathing. The current approach in the primary dentition is rapid maxillary distraction to open the narrow palate, decrease nasal resistance, and promote better facial growth, and then repeated 2 years later.[19]

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