



## Use of Dillingham Appliance for the Treatment of An Anterior Open bite and Unilateral Crossbite Associated with Thumb Sucking: A Case Report

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### Introduction

Nonnutritive sucking habits are considered normal in infants and young children. However, when this habit continues into the mixed dentition stage, it can have serious dental implications. Prolonged nonnutritive sucking habits have been associated with decreased maxillary arch width, increased overjet, decreased overbite, anterior open bite (AOB), and posterior crossbite.<sup>1-3</sup> It has been suggested that early dental visits provide parents with anticipatory guidance to help their children stop sucking habits by age 36 months or younger.<sup>1-3</sup>

The types of dental changes that a digit habit may cause differ according to the amount of force applied to the teeth (force magnitude), manner in which the digit is positioned in the mouth (force direction), length of time the child engages in the habit (frequency in hours per day), and the amount of time that the habit persists (duration in months or years).<sup>4</sup> Clinical experience suggests that 4 to 6 hours of force per day is probably the minimum necessary to cause tooth movement.<sup>5</sup> The most frequently reported dental outcomes of an active digit habit are posterior crossbite, anterior open bite and increased overjet.<sup>4</sup>

This case report illustrates and discusses the use of a Dillingham appliance for stopping a thumb sucking habit and correcting the associated malocclusions.

### Description of Case

A nine-year-old Hispanic male presented to Loma Linda University's Pediatric Dental Clinic for comprehensive dental evaluation. The patient presented with an anterior open bite and unilateral left anterior and posterior cross bite. The patient uses thumb sucking to self sooth and help him fall asleep at night. The patient expressed desire to stop the habit. Health history was non contributory to dental treatment and no known allergies were reported.

Extraoral examination of facial forms and profile revealed that patient had slight asymmetrical facial proportions with rotation of the mandible upon occlusion. Temporomandibular movements were within normal limit. Profile was slightly convex.

Panoramic and intraoral radiographs were obtained and dental caries addressed before initiating orthodontic treatment . Cephalometric analysis revealed a skeletal class I relationship (Figure 4). Tanaka-Johnson mixed dentition space analysis was carried out, which revealed that patient has discrepancies of 4.6 mm excess in the mandible and 2.1 mm deficiency in the maxilla.

Comprehensive clinical examination revealed that the patient was mixed dentition stage with class I molar and canine relationship. He had a 4 mm mandibular midline shift to the left, narrow palatal vault, a 5 mm anterior open bite, and crossbite on teeth #H, #I, #J, and 14 with #M, #L, #K, and 19. (Figure 1). Soft tissue examination showed that the patient had ankyloglossia with difficulty in pronouncing the letter "S", words with that letter as well as counting from one to five.

### Treatment Plan

Treatment objective was to stop the thumb sucking habit, correct the anterior open bite, correct anterior and posterior cross bite, relieve ankyloglossia and improve speech.

Treatment plan consisted of utilizing a Dillingham appliance which is a fixed appliance with two arms that act as a reminder for the patient to stop thumb sucking. The appliance also functions as an expansion device (Figure 3). Laser frenectomy to release the ankyloglossia was also performed.

### Treatment Progress

Prior to appliance delivery, patient motivation to stop thumb sucking habit was assessed and confirmed. It was explained to the patient that the arms of the appliance were placed as a reminder to not to suck his thumb. The patient's parents were instructed to activate the expansion part of the appliance by turning the key one turn a week.

It was observed that the patient's thumb sucking habit stopped one month after appliance delivery. Patient's ankyloglossia was addressed at this time. It was corrected by a frenectomy utilizing a CO<sub>2</sub> laser. Post-frenectomy, the patient's speech improved significantly.

Following the frenectomy, glass ionomer buttons were placed on the occlusal surfaces of teeth #19 and #30 and enameloplasty was performed on all four primary canines to create space and help correct the crossbite. During this time, the parents were instructed to continue expansion once a week.

Correction of the anterior open bite and crossbites was observed four months later, a total of 5 months of treatment. Once correction of open bite and crossbites was achieved, the parents were instructed to stop activating the appliance and were advised to keep the appliance as a retainer and to monitor for possible relapse in expansion.

Patient presented at 8 week follow up appointment with teeth #8 and 9 in edge-to-edge bite. Patient was advised to use the tongue blade technique three times a day, five minutes each time. Four weeks later, the patient was re-evaluated with slight improvement in anterior bite. At this appointment, the arm of the Dillingham appliance was modified in a U shape to slightly tilt #8 and 9 facially to correct the edge-to-edge bite (Figure2). At seven days follow-up teeth were out of cross bite and presented with 2 mm overjet . The appliance was kept as a retainer for 3 months.

At the 3-month orthodontic follow-up visit, ectopic eruption permanent maxillary canines was observed radiographically. The permanent maxillary canines were noted to be at a mesial angulation overlapping the root of the lateral incisors. It was decided to extract the primary maxillary canines to allow for more favorable eruption of permanent counterparts. Upper Hawley retainer was delivered (Figure 3). Patient is currently being followed up regularly at Loma Linda University's Pediatric Dental Clinic to monitor eruption of canine as well as provide preventative and restorative dental care.



Figure 1 – Pre- Op Clinical Pictures

Figure 2 – Post- Op Clinical Pictures



Figure 3 – Dillingham Appliance and Hawley Retainer

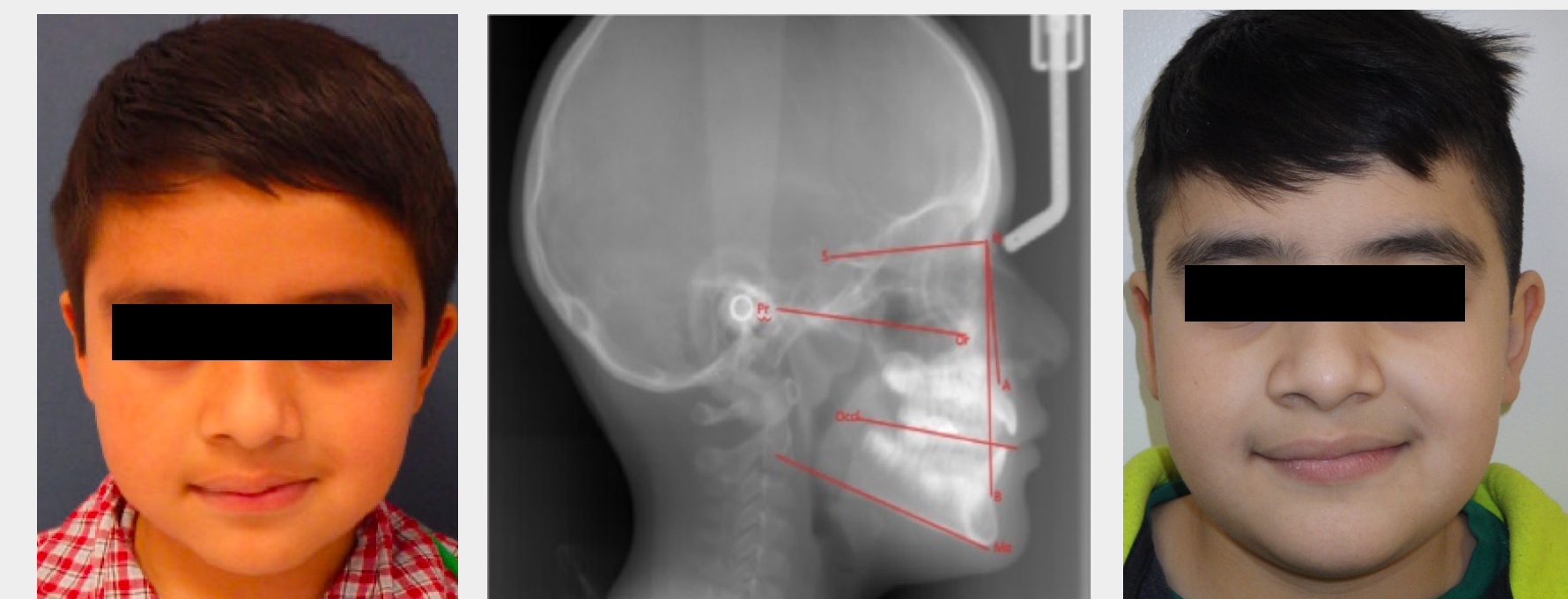


Figure 4 – Extra Oral Clinical Pictures and Cephalometric Analysis

### Discussion

Oral habits have been implicated as one of the most common factors in the occurrence of anterior open bites.<sup>6</sup> This type of malocclusion is frequently seen in pacifier sucking, thumb sucking, and individuals with a tongue thrust.<sup>6</sup> Dental malocclusions may cause aesthetic and functional impairment that require high treatment costs, which in turn negatively impact patients' and parents' quality of life.<sup>6-7</sup>

The AOB associated with deleterious habits can be successfully treated by means of interception at an early stage. Management of these cases should begin by counseling the parent and child about the effects of digit sucking on the developing dentition and determining child's willingness to stop the habit. It must be stressed that the patient's motivation and compliance is essential in treatment success, otherwise, relapse of the dental malocclusion is likely to occur once the appliance is removed.<sup>7</sup> The ideal age for the maxillary expansion is in mixed dentition, reducing the risk of damage and optimizing the procedure. As the patient progresses in skeletal age, the risk of damage to the supporting tissues increases particularly in growing patients.<sup>8</sup>

In this case, the goals of treatment that include cessation of the thumb sucking habit, achieving adequate maxillary expansion and correcting the associated crossbites as well as releasing the ankyloglossia and improving speech were fully achieved along with functional reestablishment of the occlusion. It must be emphasized during treatment that without the cooperation of the child and their motivation to stop the habit, the use of orthodontic appliances is not sufficient. The patient's role is key to achieve good results.<sup>9</sup> Additionally, a multidisciplinary approach should focus on efforts to build up the child's self-confidence and self-esteem.<sup>8</sup>

### Conclusion

- Pediatric dentists will likely be the first to detect and manage malocclusions.
- Early diagnosis and treatment of malocclusion can contribute to the development of a stable, functional, esthetically acceptable occlusion in the permanent dentition.
- Systemic approach to evaluating a patient will aid in proper diagnosis and treatment planning.
- The Dillingham appliance was effective in maxillary expansion and worked as an effective tool in stopping the thumb sucking habit and re-establishing proper occlusion.

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