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Case Report

Modified Haas Expander for the Treatment of Anterior Openbite and Posterior Crossbite Associated with Thumb Sucking-A Case Report: 3-Years Follow-Up

Nargiz Muradova, Ayça Arman Özçırpıcı

Department of Orthodontics, Başkent University School of Dentistry, Ankara, Turkey

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ABSTRACT

Thumb sucking is an abnormal habit that occurs in childhood and can cause several malocclusions if it persists for a long time. Malocclusions caused by oral habits require proper treatment timing to maintain a normal growth and should be treated at an early age. This case report shows the management of thumb sucking and early correction of anterior open bite and posterior crossbite by a modified Haas expander. Three-year follow-up results showed the effectiveness of this special designed appliance.

Keywords: Thumb sucking, Modified Haas expander, anterior openbite, posterior crossbite, tongue crib

INTRODUCTION

Abnormal oral habits are repetitive actions that may lead to disturbance in physical growth depending on their frequency, duration, and intensity (1). Thumb or finger-sucking is one of the most common oral habits practiced by children, occurring in approximately 17% of them (2, 3). Malocclusion prevalence studies have established that prolonged thumb sucking may cause specific abnormal effects on occlusion, surrounding bone development and orofacial musculature function (4, 5).

Traisman (6) reported a highly significant difference in the number of malocclusions, with 9.7% in thumb-suckers compared with 6.7% in non-thumb-suckers. Thumb sucking for extended periods can lead to various types of malocclusion including anterior open bite, posterior crossbite, increased overjet, crowding, and increased probability of developing a Class II malocclusion (7).

The main cause of posterior crossbite in thumb-suckers is alteration of the functional equilibrium between the tongue and orofacial musculature (8). This imbalance leads to the narrowing of the maxillary arch that results with a posterior crossbite.

Intense habits can deform the alveolus and dentition during the primary dentition years (9). Finger pressure can impede the eruption of the permanent incisors and cause anterior open bite. Most of the changes resolve spontaneously as soon as the habit stops before the eruption of the permanent incisor.

Here, we report a case of a thumb-sucker patient with anterior open bite and posterior crossbite in the early mixed dentition stage.

Address for Correspondence: Nargiz Muradova, Department of Orthodontics, Başkent University School of Dentistry, Ankara, Turkey
E-mail: dr.nargiz_hasanova@yahoo.com

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CASE PRESENTATION

Diagnosis

An 8-year- and 4-month-old male patient accompanied by his parents was referred to the Department of Orthodontics with a chief complaint of prolonged thumb sucking (Figure 1). The patient was in the early mixed dentition stage. No pathological background information was reported according to his medical history.

Unilateral posterior crossbite, 3.5 mm anterior open bite, slight midline deviation to the left, and a constructed maxillary arch were revealed on complete clinical examination. He presented a Class I molar relationship on the right side and Class II on the left side (Figure 2).

His anamnestic information revealed that his sucking habit lasted all night long; however, he stopped the habit when someone reminded him during daytime.

His skeletal and alveolar structures appeared to be normal in panoramic radiographs. Cephalometric analysis showed that

Figure 1. Thumb sucking position

Figure 2. Pretreatment (T_0) extraoral and intraoral photographs

Figure 3. Cephalometric radiographs

Table 1. Cephalometric measurements

Parameter	Norm	Pretreatment T_0	Posttreatment T_1	3-year follow-up T_2
SNA (°)	80±2	92.1	91.7	90.8
SNB (°)	78±2	86.0	84.8	86.5
ANB (°)	2±2	6.0	6.9	4.3
Wits (mm)	0±1	2.1	0.9	–0.7
SN-GoGn (°)	32±6	26.0	28.3	24.0
FMA (°)	25	18.5	17.7	15.8
U1-PP (°)	112±6	117.6	115.3	114.0
IMPA (°)	90±3	106.5	97.2	93.2
U1-NA (mm)	4.0	–1	0.8	3.3
L1-NB (mm)	4.0	7.5	5.6	4.6
UL-E (mm)	–4	0	–0.1	–2.2
LL-E (mm)	–2	1.4	1.6	–0.9

both the maxilla and the mandible were protrusive relative to SN, whereas the ANB angle was 6° (Figure 3 and Table 1). Although the patient had an anterior open bite, he a skeletally low angle. The lower incisors were proclined due to the altered type of thumb sucking pressure on them.

Treatment goals

The main goals of treatment were breaking the habit, correcting posterior crossbite, providing the necessary environment for permanent teeth eruption, and obtaining normal overbite.

Written informed consent was obtained from the parents of the patient.

Treatment plan and progress

A special appliance was designed by modifying the Haas expander for preventing thumb sucking and expanding the maxilla at the same time (Figure 4). This expander was anchored to the deciduous second molars and canines. A tongue crib, which was used to help break the habit, was attached to the anterior arms of the expander behind the anterior teeth. The crib was covered with acrylic making it smoother and was split into two so as not to prevent the expansion. The patient's mother was instructed to activate the screw two turns per day in the first 10 days and

Figure 4. Modified Haas expander with tongue crib

then once a day. Expansion was performed until transverse overcorrection was obtained on the deciduous molars. After completion of the active expansion phase, the expander was kept in the mouth for 6 months for retention of the expansion and ensuring that the habit has truly stopped.

Treatment Results

Posterior crossbite was corrected successfully, including the permanent molars, even though no direct forces were applied on them. When the proper transverse dimension was achieved in the maxilla, the mandible returned to its normal position, resulting in spontaneous correction of the midline and a Class II molar relationship on the left side (Figure 5).

Thumb sucking was reduced significantly in the first weeks with the appliance and was prevented completely at the end of the first month. The delayed permanent anterior teeth eruption was normalized when finger pressure was eliminated.

The appliance was removed at the end of 6 months and was recalled for follow-up visits at 3-month intervals for 3 years (Figure 6).

The overall treatment resulted in a slight posterior rotation of the mandible. The ANB angle showed a slight increase after expansion, whereas the SNA angle remained unchanged. During the follow-up period, mandibular growth was mainly in an anterior direction, resulting in an increase in SNB angle and a decrease in ANB angle (Table 1). Proclined lower incisors were found to tip lingually at the end of the treatment and continued with increasing age (Figure 7).

Figure 5. Posttreatment (T_1) extraoral and intraoral photographs

DISCUSSION

The period between age 3 and 6 years is the transitional period for addressing potential oral habits (10). Abnormal oral habits, such as thumb sucking, should be decreased significantly by the end of this period. If the habit is not eliminated before the permanent incisors erupt, it leads to considerable malocclusions, especially for those who continue the habit for a duration of ≥6 h/day (11).

Our patient was in the early mixed dentition stage and had already anterior open bite because of thumb sucking. Many studies have reported that if the habit is stopped during the mixed dentition years, some of the adverse dental changes will begin to reverse naturally (10, 12). At the end of 6 months of treatment, anterior open bite was corrected spontaneously due to increased growth of the alveolar processes and eruption of the permanent incisors.

In contrast to anterior open bite, posterior crossbite is not a self-correcting malocclusion and should be treated early to avoid the negative long-term effects on growth and development of the teeth and jaws (13). Our patient had unilateral posterior crossbite in the left side that was corrected with a modified Haas expander.

Routine orthodontic treatment protocols require more than one appliance to break the habit and correct the malocclusion. Orthodontic approaches with more than one appliance increase treatment time and costs. The present design used in this case was effective in the correction of anterior open bite and posterior crossbite at the same time. On the other hand, as compared with conventional rapid palatal expansion appliances, the expander was anchored on deciduous teeth to prevent any damage or negative effects to permanent teeth.

CONCLUSION

The long-term stability of crossbite and open bite correction associated with thumb sucking in the mixed dentition was favorable. The unique design of the appliance provided an opportunity to resolve three major problems with one appliance and can be preferred as a convenient alternative to conventional habit breakers.

Figure 6. Three-year follow-up (T_2) extraoral and intraoral photographs

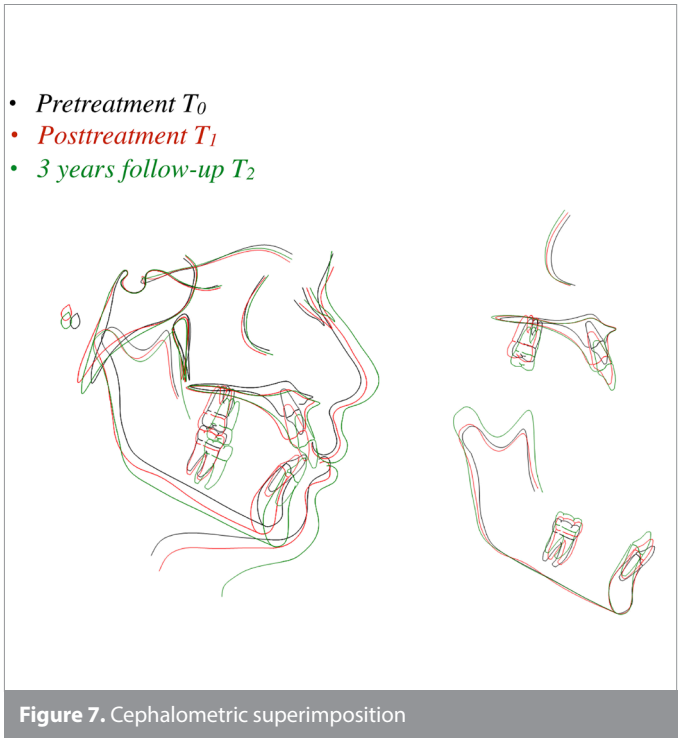

Figure 7. Cephalometric superimposition

Informed Consent: Written informed consent was obtained from the parents of the patient who participated in this study.

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