

Modified Palatal Crib Appliance for Habit Correction: A Case Report

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Abstract

Digit sucking is the most commonly seen oral habit & one of the most common learned patterns of behaviours seen in children of preschool age and is a habit of concern as it is an important etiological factor in the development of malocclusion, a secondary tongue thrust develops leading to the exaggeration of the condition. To plan an appropriate treatment it is important to understand the etiology, which includes psychological, physiological and anatomical and planning for behavior eradication is critical for the positive outcomes. Starting from counselling to appliance therapy, ample treatment modalities have been reported in the literature. Many appliances have been developed for habit correction and have been modified depending on the patient compliance. Palatal crib is one such appliance for treating digit sucking habit & tongue thrusting. This case report describes a 12-year-old girl who reported to our department with a history of digit sucking habit which was intervened using modified palatal crib appliance.

Keywords: Modified Palatal Crib, Habit Breaking Appliance, Digit Sucking Habit, Tongue Thrusting Habit

Introduction

Habit is defined as a fixed practice produced by a constant repetition of an act¹. Oral habits are common in children. These habits include: non-nutritive sucking habits (thumb/finger/pacifier), tongue-thrusting, tongue sucking, lip or nail biting habits & bruxism. Non-nutritive sucking habit comprises the use of pacifiers, blankets and digit sucking. The term digit sucking is synonymous with finger sucking or thumb sucking. It is defined as the placement of the thumb or one or more fingers in various depths into the mouth. The prevalence of this habit as reported by investigators ranges from 1.7% to 47%². This habit develops early in life around 29 weeks of age and continues from infancy through primary, mixed and permanent dentition. If the habit continues into the mixed dentition a malocclusion may develop³. Proffit and Mason defined tongue-thrusting habit as the protrusion of the tongue against or in between the anterior dentition with excessive circumoral muscle activity during swallowing. They also stated that one or more of the following conditions should

exist to define the thrust: first, the tongue should move forward to contact the lower lip during swallowing. Secondly, the forward movement of the tongue between the anterior teeth during speech may be observed. Finally, a forward positioning of the tongue with the tip of the tongue positioned between or against the anterior teeth at rest.⁴

Various side-effects of these habits are anterior open bite, increased overjet, labial inclination of upper incisors & lingual inclination of lower incisors, Posterior cross bite. Spontaneous correction of the dental changes occurs if the habit ceases before the age of 5 years and thus do not require any treatment.^{5,6} The treatment approaches for these habits should be carried out in the following stages⁷

1. Direct counselling of the patient
2. Reminder therapy
3. Rewards concept



4. Orthodontic appliance treatment.

This paper describes the clinical case report of a 12-year-old girl whose habit was corrected using a modified palatal crib appliance.

Case Report

A 12-year-old girl accompanied by her mother reported to the Department of Pedodontics and Preventive Dentistry, Ramaiah University of Applied Sciences Bengaluru, with a chief complaint of digit sucking habit since she was 2 years old. A detailed history was recorded; mother revealed that the child is practicing digit sucking habit regularly for 8-9 hrs/day during waking hours, also reported that the patient had speech problems and was undergoing speech therapy. On examination callous formation was seen over the right middle and ring finger and places her digits up to her 1st phalanges.[fig.1] As duration and intensity of digit sucking was intense, the child presented with anterior open bite with simple tongue thrusting. [fig.2] & was in mixed dentition stage and reversible pulpitis wrt 85 which was restored using GIC type II. All the other methods of habit cessation attempted had failed in this patient. Thus appliance therapy was planned. A fixed habit breaking appliance, i.e., a palatal crib was planned and modification was done to the palatal crib as the patient had speech problems. Accordingly the first molars were banded, and alginate impression was made. The crib was fabricated on the cast using a 0.8mm stainless steel wire⁸, then the joints of the crib were soldered, and over the crib small round beads were placed using silver solder [fig.3]. In the next appointment, the appliance cementation was done using GIC type I [fig.4] The patient reported again after 2 weeks, mother gave a positive feedback about the regression of the habit. There were observable changes on the finger, while follow-up check-up after 3 months showed a marked reduction in the habit and the callous formation on the digit had resolved completely. Patient was asked to wear appliance for at least 6 months after the reversal of habit to avoid relapse of the habit, post-treatment follow-

up showed no relapse. After that period of 6 months, the appliance was removed.

Discussion

The habit of sucking the finger (or thumb) is considered to be performed for oral gratification and psychological reassurance. Severe digit sucking can lead to proclination of maxillary anteriors, constriction of the maxilla, retroclination of the mandibular incisors, increased overjet and anterior openbite⁹.

Usually, in cases with anterior open bite due to thumb sucking, a secondary tongue thrust develops leading to the exaggeration of the condition. The line of treatment for the prolonged digit sucking involves positive reinforcements, developing a desire in the patient to quit the habit, reminders and appliances which act as a mechanical barrier as well as physical reminders. Appliances consisting of cribs in the anterior region are found to be very effective as reminders as well as physical restrainers¹⁰⁻¹³.

In the present case the patient had digit sucking habit along with tongue thrusting and also reported to have difficulties during speech. To plan an appropriate treatment it is important to understand the etiology that includes psychological, physiological and anatomical and planning for behaviour eradication for the positive outcomes.

Counselling to appliance therapy, ample treatment modalities have been reported in the literature, we planned to counsel the patient first but there was no change in the habit. Hence we planned to give an appliance to break both the habits, but considering the speech problem, we planned to modify the palatal crib appliance so that there is no interference with the speech.

Pathophysiology of Finger-sucking Damage to Occlusion

Several studies have been conducted to understand the pathophysiology of finger-sucking damage to the occlusion.



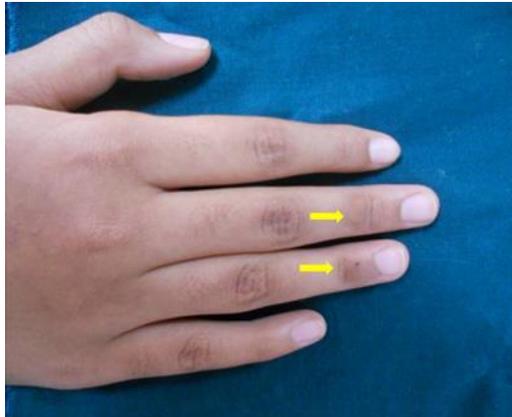


Fig. 1 Digits showing callous formation



Fig. 3 Fabrication of the modified palatal crib appliance



Fig. 2 Patient showing anterior open bite with simple tongue thrusting



Fig. 4 Cementation of the appliance

A study by Ahlgren to examine the activity of the mentalis, buccinator and lip muscles during non-nutritive sucking habits using Electromyography (EMG) found more electromyographic activity in the lip and mentalis muscles than in the buccinator muscle.¹⁴

Proffit stated that the anterior open bite malocclusion seen in thumb-sucking individuals is caused by interference to eruption of the incisors accompanied by eruption of the posterior teeth. He indicated that the possible cause for the posterior crossbite malocclusion is a combination of lower tongue position and increased cheek activity during sucking.¹⁵ On the contrary to what Proffit hypothesized, Larsson and Ronnerman in a comparative study in children aged between 9-13years with prolonged finger sucking habit and children without habit found that modelling of the alveolar process was probable cause for open bite and not the arrested eruption of the incisors. Once the habit is stopped the inhibition of the vertical growth of the anterior maxillary process might self-correct, permanent effects on occlusion is anticipated and self-correction might not occur if the child continues the finger-sucking habit after pubertal growth.¹⁶ Possible factors leading to



retention of this abnormal malocclusion include abnormal tongue and lip functions.

Effects of Tongue-thrust on Occlusion and Speech: The effects of tongue-thrust on occlusion have been the subject of controversy. Tongue-thrust habit may be a contributing or a maintaining factor in malocclusion, lisping or both. Tongue-thrusting has been associated with speech problems, like anterior lisp and articulatory problems with some consonants such as S, Z, T, D, L, and N^{17,18}. Depending on the severity of malocclusion and the child's compensative ability, the open bite may result in articulation errors¹⁹. Tulley in a survey examined over 1,500 11-year-old school children for a tongue-thrust habit found that some children displayed lisping in their speech though they had an excellent occlusion²⁰.

Relationship between Tongue-thrust and Thumb-Sucking: All open bites are accompanied by a tongue-thrust. In cases of the thumb-sucking habit, spontaneous correction of the open bite usually occurs after the elimination of habit except in cases where there are other associated habits. Other habits could include tongue-thrusting, mouth breathing and hyperactive perioral muscles²¹. In a case control study of 723 children aged 10-11 years, it was found that children with thumbsucking habit showed an increased tendency of tongue-thrust swallow and teeth apart swallow compared to the control group²². da Silva Filho et al in a study found the difference that, in thumb-sucking subjects the anterior open bite was circular in contour, in tongue-thrust swallow it was diffuse or rectangular in shape²¹.

Conclusion

Prolonged finger-sucking habit is a risk factor in malocclusion predominantly anterior open bite. A posterior crossbite might be associated with the finger-sucking habit, but it occurs more with prolonged pacifier use. It was found that the longer the habit, the more the associated damage to the primary and permanent dentition. Methods for habit intervention include counselling,

positive reinforcement, a calendar with rewards, an adhesive bandage, bitter nail polish, long sleeves and appliance therapy. It is recommended to start with the least invasive methods before using habit breaking appliances. Some children need additional help to stop the habit and in that case habit-breaking appliances are indicated. Habit-breaking appliances are either fixed or removable. One of the fixed appliances used to break the habit is the palatal crib appliance.

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