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Case Report

# Effects of Tongue Cribs for the Early Treatment of Anterior Open Bite: A Case Report

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## Abstract

**Background:** The tongue cribs have been used to eliminate bad habits of thumb suckling and tongue thrusting. These habits are thought to be possible causes of malocclusions, and the major one is open bite. Open bite is one of the most difficult malocclusions to treat, and severe open bite cases would also require surgical orthodontic treatment. This article describes the orthodontic treatment with tongue cribs for a pediatric patient with anterior open bite.

**Case:** Her chief complaint was anterior open bite. Overbite was -3.0 mm, and she was often confirmed the tongue thrust during resting and talking. We started her maxillary expansion by a removable expansion plate with tongue cribs to correct anterior open bite and encourage the permanent tooth eruption. After 26 months of active orthodontic treatment, open bite was improved, and the eruption of permanent teeth made good progress. We suggest that the appliance with tongue cribs might be useful and effective in the treatment of open bite, and the follow-up is necessary and very important.

## Introduction

The tongue cribs have been used to eliminate bad habits of thumb suckling and tongue thrusting [1-3]. These habits are thought to be possible causes of malocclusions, and the major one is open bite [4-6]. Orthodontists consider that open bite is one of the most difficult malocclusions to treat, and severe open bite cases would also require surgical orthodontic treatment to achieve improvements of both function and occlusion [7-9]. Therefore, we expect early treatment to milder future dental and skeletal problems and alleviate the complexity of the phase-2 treatment. In the present case report, we demonstrate satisfactory progress in a pediatric patient with anterior open bite treated by the expansion plate with tongue cribs.

## Case Report


**Figure 1.** Pretreatment intraoral photographs. (A) Right molar relationship; (B) Centric occlusion; (C) Left molar relationship; (D) Overjet; (E) Mirror view (maxillary); (F) Mirror view (mandibular).

A girl patient, 7 years and 10 months of age had a chief complaint of anterior open bite. Overjet was 0.5 mm, and overbite was -3.0 mm (Figure 1). She had anterior open bite and a mesial step type of the terminal plane on both sides. She had a family history of Class III malocclusion: her brother, sister and mother. She was often confirmed the tongue thrust during resting and talking. A panoramic radiograph showed the lack of eruption spaces for the permanent teeth (Figure 2). Cephalometric analysis, when

compared with the Japanese norm, showed a skeletal Class I jaw-base relationship (ANB, 4.1°). Both the mandibular plane angle and the ramus plane angle were large, and the Gonial angle was almost normal (Mp-SN 43.9°, Rp-SN 97.9, Go.A 126.0°). The mandibular body length was large, and ramus height was short (67.2 and 32.9 mm). The inclinations of the upper and lower incisors were within the normal range (U1-SN, 106.5° and L1-Mand. pl., 88.9°).

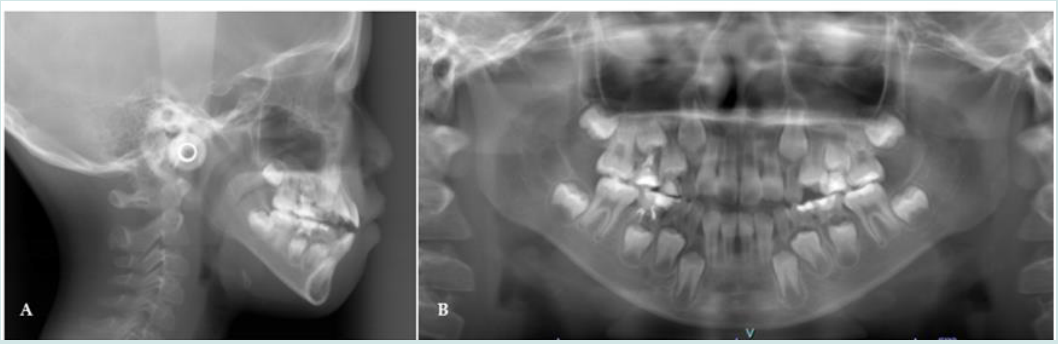


**Figure 2 :**Pretreatment lateral cephalogram (A) and panoramic radiograph (B).

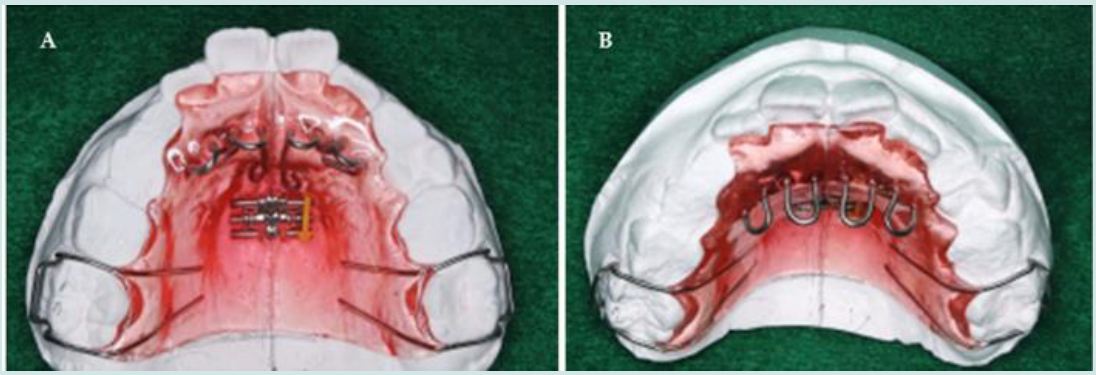


**Figure 3:** Photographs of a removable expansion plate. (A) Expansion screw; (B) Tongue cribs.


**Figure 4:** Treatment progress. (A) 6 months after the start of treatment; the expansion plate with tongue cribs was placed; (B) Centric occlusion; 13 months later.

The patient was diagnosed as anterior open bite, with a skeletal Class I jaw base relationship, habitual tongue thrust and the lack of eruption spaces for the permanent teeth. The treatment objectives were to correct the open bite with the habit breaker in an early stage, to arrange the maxillomandibular arch forms, to obtain eruption spaces for the permanent teeth and to reduce the need for the phase-2 treatment. We explained sufficiently her treatment precautions to her and her parents. Firstly, her jaw base relationship would change from a skeletal Class I to a skeletal Class III with growth because she had a family history of Class III malocclusion, and we regretted our inability to predict her mandible growth. Moreover, she would need surgical orthodontic therapy in the second stage as open bite was difficult-to-treat malocclusion. Furthermore, the phase-2 treatment would be likely to be needed, despite the phase-1 treatment. They hoped orthodontic treatment with the understanding of these ones. Thus, we started her orthodontic treatment.

At the age of 8-year, maxillary expansion was performed by a removable expansion plate firstly. We incorporated tongue cribs in the expansion plate (Figure 3A & 3B). She and her mother were instructed to use it every night and turn expansion screws weekly on the specified day of week (1/4 turn: 0.25 mm). About 6 months after the start of this device, the overbite increased slightly (Figure 4A). Because the overbite was not yet fully corrected, we encouraged her to continue use of this plate. She was evaluated regularly for the improvement of the overbite, the eruption of permanent teeth and the maxillomandibular skeletal relationship. After 13 months of active treatment, the occlusion was much more stable and acceptable (Figure 4B). As we monitored the maxillomandibular skeletal relationship, the patient was instructed to continue using the plate. After 13 months more, overjet and overbite were well maintained (Overjet, 1.0 mm and Overbite, 1.5 mm), and the eruption of the permanent teeth also proceeded uneventfully (Figures 5, 6). Now, though maxillary expansion was stopped, she continues using this plate to obstruct patients' harmful tongue habits by tongue cribs. Posttreatment cephalometric evaluation showed a skeletal Class I jaw base relationship (ANB, 1.5°). The mandibular plane angle and the ramus plane angle were decreased by 3.2° and 5.4° with a counterclockwise rotation of the mandible. The upper and lower incisors were maintained within the normal range even though the upper one was labially inclined as compared with pretreatment (U1-SN, 111.1° and L1-Mand. pl., 89.9°) (Table 1).

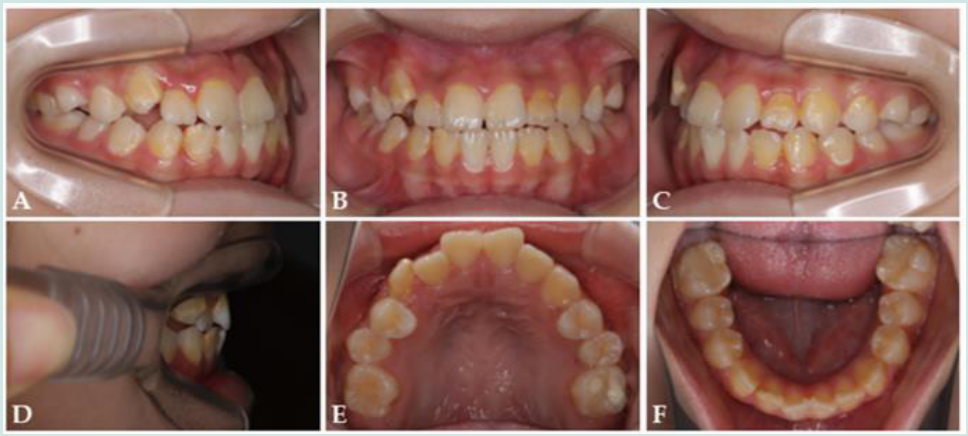


**Figure 5:** Posttreatment intraoral photographs. (A) Right molar relationship; (B) Centric occlusion; (C) Left molar relationship; (D) Overjet; (E) Mirror view (maxillary); (F) Mirror view (mandibular).

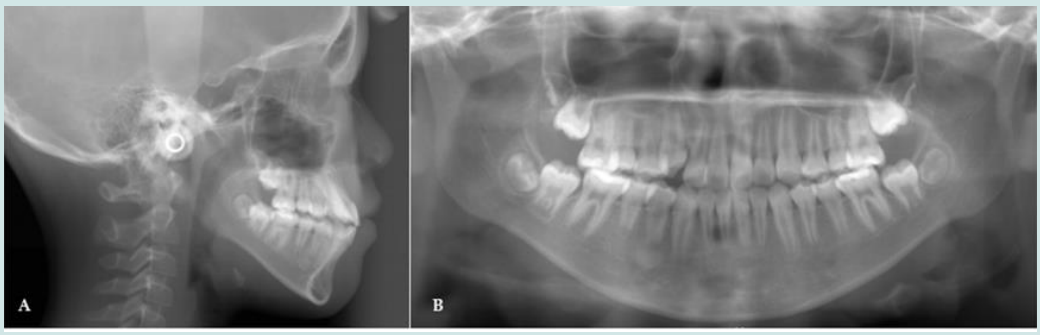


**Figure 6:** Posttreatment lateral cephalogram (A) and panoramic radiograph (B).

**Table 1**: Cephalometric summary [10,11].

| Variables | Japanese norm* | SD | Pretreatment (7 yrs 10 mos) | Posttreatment (10 yrs 3 mos) |
|---|---|---|---|---|
| Angles (°) | | | | |
| ANB | 2.8 | 2.4 | 4.1 | 1.5 |
| SNA | 80.8 | 3.6 | 85.8 | 82.3 |
| SNB | 77.9 | 4.5 | 81.7 | 80.8 |
| Mand.pl. - SN pl. | 37.1 | 4.6 | 43.9 | 40.7 |
| U1-SN pl. | 105.9 | 8.8 | 106.5 | 111.1 |

| | | | | |
|---|---|---|---|---|
| L1-Mand. pl. | 93.4 | 6.8 | 88.9 | 89.9 |
| Interincisal angle | 123.6 | 10.6 | 120.7 | 118.4 |
| **Linear (mm)** | | | | |
| Wits value | -1.92 | 2.52 | -4.1 | -6 |
| Overjet | 3.1 | 1.1 | 0.5 | 1 |
| Overbite | 3.3 | 1.9 | -3 | 1.5 |

## Discussion

In this study, we reported the successful outcome of the early treatment using tongue cribs for the child patient with anterior open bite. Several reports have described the treatment protocols for anterior open bite in the mixed dentition. Erbay et al. suggested the effects of Fränkel's function regulator appliance on the treatment of Angle Class I skeletal anterior open bite malocclusion [12]. Defraia et al. treated with the open-bite bionator, and Işcan et al. indicated the improvement of the overbite by the posterior bite-block during growth period [13,14]. Moreover, others also reported the early treatment of anterior open bite with maxillary expansion appliances, vertical chin cup, high-pull activator and bite jumping appliances [15-19]. Since open bite is closely related to mouth breathing, swallowing and tongue resting position and pressure, it is considered that a combination of the traditional orthodontic therapy and myofunctional therapy is the most effective treatment [20,21]. As this girl had a pronounced tendency to advance tongue, we submitted that the guidance of oral myofunctional therapy was also necessary for her in parallel with the use of the orthodontic appliance. However, she was a child with hyperactivity, and it was difficult to provide the treatment on the basis of the patient autonomy such as myofunctional therapy. Therefore, we decided to treat her with only a simple device as much as possible.

According to cone-funnel mechanism, the mandibular dentition was naturally expanded to fit the maxilla by expanding of the maxillary dentition only [22]. Then, she could obtain eruption spaces for the permanent teeth in both arches. Moreover, as to the theory of transverse control reported by Sabashi et al. improving disharmony of arch forms would appropriately rearranged both dentitions on the maxillomandibular relation and controlled muscle function [23]. Moreover, tongue cribs would work as an obstacle in patients' harmful tongue habits and maintain the tongue in a more backward position as others also described [1,2,24,25]. Consequently, they might also change perioral muscular activity and minimize the open rotation of mandible in a growing period. As indicated in Table, the upper and lower incisors were labially inclined as compared with pretreatment, despite the removal of tongue thrusting by tongue cribs. This was considered that eruption of the permanent teeth was stimulated by expanding her jaws, and the upper and lower anterior teeth were pushed on the labial side. For now, her overbite is maintained stability. However, she should be evaluated regularly for signs of relapse because the difficulties of the early treatment and retention of open bite are well known [26,27]. Furthermore, we should also have to keep the skeletal relationship under observation until completion of growth because she had a family history of Class III malocclusion. The follow-up is necessary and very important in the phase-1 treatment of children because of the inability to predict their growth.

## Conclusions

We reported the successful treatment of a pediatric patient with anterior open bite by the simplest device with tongue cribs. After the treatment, an acceptable occlusion was obtained, and no relapse of the open bite is still seen. This suggests that the appliance with tongue cribs might be useful and effective in the treatment of open bite, referred to as the most difficult malocclusion to treat in orthodontic treatment.

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