Use the Lip Bumper Appliance to Control the Lower Lip Biting Habit

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INTRODUCTION

The resting pressure of tongue and lips, as well as the forces generated within the periodontal membrane are the primary factors in the dental equilibrium.\textsuperscript{1} Extraoral forces exerted by the orbicularis oris, mentalis and buccinator muscles are balanced by the opposing forces from the tongue. Malocclusion may come from unbalanced muscle equilibrium which could be altered by parafunctions, such as lip sucking, lip biting, and tongue thrusting.\textsuperscript{2}

Elimination of abnormal habit is the basis for long-term treatment stability. It is known that a lip bumper could be a solution to overcome the lower lip sucking or lip biting habit that causes malocclusion.\textsuperscript{3}

According to several studies, lip bumper could deliver effect to control molar anchorage, gain the lower arch space, and correct the bad oral habits.\textsuperscript{4-12} The lip bumper that used in this case was made by stainless-steel wire with diameter 0.040 inch. The anterior curved wire was covered by an acrylic shield to offer the functional

Case Report

USE THE LIP BUMPER APPLIANCE TO CONTROL THE LOWER LIP BITING HABIT

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This is a 9 years old boy in mixed dentition stage, with Angle Class I malocclusion, anterior teeth crowding and proclined upper incisors. He was diagnosed with lower lip biting habit. The treatment plan was delivered with two stages treatment, stage 1 was to correct the lip biting habit by using the lip bumper. After four-month observation and lip training, the habit was corrected and the irregularity of lower dentition was decreased. Continued with stage 2 treatment, patient had upper and lower 2x4 fixed appliances to align and level the anterior teeth. The result showed the previous proclined upper incisors were moved palatally, and the lower incisors were moved labially after 3 months of treatment. The total treatment duration was 8 months.

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Keywords: lower lip biting; lip bumper; parafunctions; oral habits.

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Lower Lip Biting Habit Corrected by Lip Bumper

adaptation of lip and cheeks muscles. The recommended time to wear the lip bumper appliance should be full day for 6 to 18 months of duration, based on different level of tooth movement and the treatment goal.

The purpose of this case report was to present the effect of lip bumper appliance on Class I mandibular crowding caused by lower lip sucking habit in mixed dentition.

CASE REPORT

Clinical finding and Diagnosis

A 9-years old boy came with his mother to seek treatment for his crooked front teeth. The intra-oral examination demonstrated early mixed dentition with Angle Class II malocclusion, anterior teeth crowding, and proclination of upper incisors. Patient also presented persistent lower lip biting unconsciously (Figure 1, 2, 3).

The lateral cephalometric analysis indicated a skeletal Class I relationship with normal mandibular plane angle. Proclined upper incisor and decreased inter-incisal angle was observed. The cervical vertebral maturation (CVM) stage was in stage 1 to 2 (Figure 4, 5).

Treatment Objectives

The initial treatment objective was to eliminate the lower lip biting habit. The second and third treatment objectives were to align anterior teeth and achieve a normal overbite and overjet. The skeletal growth and space deficiency could be monitored after correction of the lip biting habit and alignment of the front teeth.

Treatment Plan

The treatment plan would be delivered into two phases. The first phase was to align upper front teeth and control the lower lip biting habit. The second phase was to align the lower anterior teeth by using the dental space created by the effect of lower lip bumper.

Treatment Progress

In phase one treatment, 2x4 fixed appliance was bonded in upper dentition; and the lower lip bumper was inserted (Figure 6). The lower lip biting habit was eliminated and the lower incisors were uprighted by decrease in irregularity index after 4 months of treatment. In the second phase, the lower 2x4 fixed appliance was bonded for another 3 months (Figure 7).

Treatment Result

During the four months of phase one lower lip bumper treatment, the lower irregularity index decreased from 4.15 to 2.82. The total arch length (the sum of the right and left distances from the mesial contact points of the first molars to the contact point of the central incisors) increased from 63.06 mm to 65.14 mm. In the cephalometric tracing, U1 to palatal plane angel decreased from 126.5 ° to 116 ° (Figure 8-10, 14; Table 1, 2).
Chen CY, Kao CT, Wu YT, Chou CC, Yang JH

Figure 2. Initial intra-oral photographs.

Figure 3. Initial dental models.
Figure 4. The panoramic film before treatment.

Figure 5. The cephalometric film before treatment.
Figure 6. Phase one: the lip bumper appliance.

Figure 7. Extra-oral photographs after treatment.

Figure 8. Intra-oral photographs after treatment.
Figure 9. The panoramic film after treatment.

Figure 10. The cephalometric film after treatment.
During the continued three months of the second phase treatment, the cephalometric superimposition demonstrated normal skeletal growth (Figure 11). The U1 to palatal plane angle was decreased from 126.5 ° to 115 ° and inter-incisal angle was increased from 113° to 121° (Figure 12, 13).

The treatment duration was 8 months. The flaring maxillary anterior teeth were well aligned, and the lower lip biting habit was well corrected. The lower anterior crowding was relieved (Figure 15, Table 1, 2).
Lower Lip Biting Habit Corrected by Lip Bumper

Figure 14. Initial and lip bumper cephalometric superimpose.

Figure 15. Initial, lip bumper and final cephalometric superimpose.

Table 1. Cephalometric tracing before and after treatment, skeletal measurements.

<table>
<thead>
<tr>
<th>Skeletal analysis</th>
<th>Norm</th>
<th>Initial</th>
<th>Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNA</td>
<td>82° (80-84)</td>
<td>83°</td>
<td>83°</td>
</tr>
<tr>
<td>SNB</td>
<td>80° (78-82)</td>
<td>80°</td>
<td>79.5°</td>
</tr>
<tr>
<td>ANB</td>
<td>4° (2-5)</td>
<td>3°</td>
<td>3.5°</td>
</tr>
<tr>
<td>Occl-SN</td>
<td>14°</td>
<td>21°</td>
<td>23°</td>
</tr>
<tr>
<td>GoGn-SN</td>
<td>32°</td>
<td>33°</td>
<td>33°</td>
</tr>
<tr>
<td>FMA</td>
<td>31° (26-36)</td>
<td>33°</td>
<td>33°</td>
</tr>
<tr>
<td>Nv-A</td>
<td>0.4mm (+/- 2.3)</td>
<td>-7mm</td>
<td>-6.5mm</td>
</tr>
<tr>
<td>Nv-Pog</td>
<td>-1.8 mm (+/-4.5)</td>
<td>-18mm</td>
<td>-20mm</td>
</tr>
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</table>
DISCUSSION

The lower lip bumper is a simple habit correction appliance and is usually well tolerated by the young patient. In orthodontics, the applications of lip bumpers were reported for molar anchorage control, correction for lower lip habit, and space gaining for alignment of mild to moderate crowding in lower dentitions.

The patient in this case had protrusive upper anterior teeth, caused by the lower lip trapping between the space of upper and lower anterior teeth that related to the lower lip biting habit. This habit was regarded as the primary etiology of malocclusion, which cause a big overjet with flaring out in upper anterior teeth. In this case, a lower lip bumper appliance was used to eliminate the lower lip biting habit and improve mentalis muscle activity. The correction of biting habit came from the reminder of the labial shield in the appliance.

The lip bumper used in this case was made of stainless-steel wire with a diameter 0.040 inches. It was placed on the lower arch from the right primary second molar to the left primary second molar. The curve of this lip bumper was located in apically to lower gingival margin and 3 mm away from the labial teeth surface. The anterior wire was covered by acrylic shield which functions as to improve the adaptation of lip and cheeks muscles. This appliance had an adjustable loop located in front of primary second molar in each side. The lip bumper appliance was suggested to wear full day for a period from 6 to 18 months, based on the different level of tooth movement and treatment goal.

After lip bumper treatment, the outcome demonstrated upper incisors inclined palatally, lower incisors inclined labially, and the large overjet was corrected because of the elimination of the mentalis muscle forces which altering the equilibrium between cheeks, lips, and tongue (Figure 15).

According to Murphy et al., most of the expansion of lip bumper occurs at the beginning of treatment and then faded with time. About 50% of the total expansion

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Table 2. Cephalometric tracing before and after treatment, dental measurements.

<table>
<thead>
<tr>
<th>Dental analysis</th>
<th>Norm</th>
<th>Initial</th>
<th>Post LB</th>
<th>Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>U1-Pp</td>
<td>108.7°+ 5.3°</td>
<td>126.5°</td>
<td>116°</td>
<td>115°</td>
</tr>
<tr>
<td>U1-SN</td>
<td>104°</td>
<td>120°</td>
<td>111°</td>
<td>108°</td>
</tr>
<tr>
<td>U1-NA</td>
<td>4mm</td>
<td>10mm</td>
<td>7mm</td>
<td>6mm</td>
</tr>
<tr>
<td>U1-NA</td>
<td>22°</td>
<td>37°</td>
<td>28°</td>
<td>25°</td>
</tr>
<tr>
<td>U1-L1</td>
<td>130°</td>
<td>113°</td>
<td>120°</td>
<td>121°</td>
</tr>
<tr>
<td>L1-NB</td>
<td>4mm</td>
<td>6mm</td>
<td>8mm</td>
<td>6.5mm</td>
</tr>
<tr>
<td>L1-NB</td>
<td>25°</td>
<td>27°</td>
<td>29°</td>
<td>30°</td>
</tr>
<tr>
<td>IMPA</td>
<td>94°+ 6</td>
<td>95°</td>
<td>97°</td>
<td>99°</td>
</tr>
<tr>
<td>FMIA</td>
<td>55°+ 6</td>
<td>52°</td>
<td>50°</td>
<td>48°</td>
</tr>
<tr>
<td>Soft Tissue</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UL-E line</td>
<td>+2mm</td>
<td>+2mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LL-E line</td>
<td>+2mm</td>
<td>+1mm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
occurs in the first 100 days of treatment and 90% of the
total expansion was achieved within the first 300 days. In
this case, lower lip bumper was used for the initial four
months. Once the lower biting habits was eliminated,
the second phase of lower fixed 2x4 appliance could be
continued. From the model analysis, the irregularity index
was decreased largely from 4.15 to 2.82 and total arch
length increased from 63.06 mm to 65.14 mm. These
results were similar with the reported literatures.3,9,13

Lip bumper treatment along with fixed appliances
is an effective treatment to obtain long-term increases in
arch width and decreases in the irregularity index.14 The
lip biting habit could be controlled earlier in the mixed
dentition, and the dental space was gained for crowding
relief by the appliance. Since the patient was still in mixed
dentition, further dental development and skeletal growth
should be monitored to make sure the long-term stability.

CONCLUSION

The elimination of adverse oral habits is the
foundation of long-term stability after orthodontic
correction.3 In this case, lower lip bumper was chosen to
overcome the habit of lower lip biting, there was no longer
lower lip trapping between the upper and lower anterior
teeth after habit control. The lip bumper also corrects
the malaligned occlusal and functional relationships
subsequently. The further dental development and skeletal
growth would be monitored for long-term stability.

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