Maxillary Deficiency Treatment by Fixed Tongue Appliance – A Case Report

By: Rahman Showkatbakhsh, DDS; Abdolreza Jamilian, DDS; Mehrangiz Ghassemi, DDS; Alireza Ghassemi, DDS; Arman Shayan, DDS.

Abstract: This case illustrates orthopaedic treatment of a 12.1 year-old girl with class III malocclusion and maxillary deficiency. The patient was treated by a fixed tongue appliance in the upper jaw. First maxillary molars and premolars were banded and a hyrax® was mounted on them in order to achieve lateral expansion. A fixed tongue appliance comprising of a few cribs was soldered to the anterior side of the hyrax® with the purpose of pushing the maxilla in forward position. The orthopaedic stage of treatment lasted for 5 months after which favourable correction of the malocclusion was observed. The SNA angle increased by 2°, the IMPA decreased by 10° and mandibular plane angle (GoGn-SN) increased by 2°. After this time, the fixed tongue appliance and Hyrax remained in the mouth for 3 more months as retention. This case demonstrates that fixed tongue appliance might be an alternative method to extra oral appliances in class III and maxillary deficient cases.

Keywords: Maxillary deficiency, Tongue Appliance, extra oral appliance, Class III.

Introduction

Skeletal Class III malocclusion can be characterized by maxillary skeletal retrusion, mandibular skeletal protrusion, or a combination of both.¹ ² The incidence of Class III malocclusions suffering from maxillary deficiency was reported to be 65% to 67%.³ If the mandible is not markedly affected in these subjects, treatment may involve stimulation and guidance of maxillary growth by orthopaedic forces. Orthopaedic correction of Class III malocclusion and maxillary deficiency has been described utilizing a Delaire style face mask⁴ or a reverse pull headgear.⁵ ⁶ Recently, Tongue plate,⁷ removable Tongue appliance,⁸ ⁹ miniplates,¹⁰ ¹² and miniscrews¹³,¹⁴ were also used for the treatment of this malocclusion. In this case report, a patient is illustrated in whom a fixed tongue appliance was used for treatment of Class III malocclusion and maxillary deficiency.

Diagnosis and Etiology

A 12.1 year old girl was initially referred to an orthodontic department for treatment of maxillary deficiency. She had no medical problems and there were no signs of temporomandibular joint dysfunction.

Class III malocclusion with a maxillary deficiency was noticed during clinical examination. The extra oral examination in profile view also confirmed maxillary deficiency (Figures 1 and 2).

Intraoral examination showed reverse overjet (Figures 3-5). Regarding the clinical examination and the possibility of being a pseudo Cl III, attempts were made to put the mandible in backward position; however, it was to no avail and we could not position the mandible in skeletal Cl I relationship.

Figures 1 & 2: Pretreatment facial photographs.

Figures 3-5: Pretreatment intraoral photographs.
Cephalometric analysis confirmed the class III skeletal pattern (Table 01) (Figure 6). Any effort to push the mandible either in the backward position or edge to edge incisor relationship was not possible; thus the patient was not a pseudo class III and the centric occlusion and centric relation were coincident and there were no temporomandibular joint signs or symptoms (Figure 7).

**Treatment Objectives**

The treatment objective for this patient was to correct the deficient maxillary arch, ideally by forward positioning of the maxilla.

**Treatment Alternatives**

Extra oral appliances, such as a protraction facemask, a Class III functional appliance, any modified maxillary protraction devices, and removable tongue appliance were considered as alternative treatments for correction of this Class III malocclusion. Orthognathic surgery at 18 years of age was also considered in case of unfavourable treatment results. Regarding the uncertainty of patient’s compliance with extra oral and removable appliances, a fixed tongue appliance was used.

**Treatment Progress**

A hyrax® (Dentaurum, ref 602-805, Inpringer, Germany) was mounted on first maxillary molars and premolars to loosen the maxillary sutures in order to facilitate the forward movement of the maxilla.

Forward movement of maxilla was achieved by a fixed tongue appliance comprising of a few curved cribs (width=1.2 mm) which were soldered to the anterior side of the hyrax® (Figure 8). The patient was instructed to activate the screw of the hyrax® by making 1/4 turn at the beginning of each week for 3 months. A complete turn of the screw would create 1mm of horizontal distance. The patient was examined and the progress was observed after each monthly visit. Positive overjet and overbite were achieved after 5 months of treatment with fixed tongue appliance and hyrax (Figures 9-13). Fixed tongue appliance and hyrax were continued for 3 more months as retention and were removed after observation of ideal stability.

**Treatment Results**

After orthopaedic stage of the treatment positive overjet of 2mm and overbite of 2 mm were achieved. SNA increased from 75° to 77° and GoGn-SN increased from 32° to 34° (Table 01). The superimposition of pre- and post-treatment cephalometric tracing on the anterior cranial base is shown in Figure 14.
Table 1: Cephalometric Analysis Before Treatment and After Use of Fixed Tongue Appliance

<table>
<thead>
<tr>
<th>Cephalometric Index</th>
<th>Pre-Treatment</th>
<th>After Orthopedic Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNA (°)</td>
<td>75</td>
<td>77</td>
</tr>
<tr>
<td>SNB (°)</td>
<td>79</td>
<td>77</td>
</tr>
<tr>
<td>ANB (°)</td>
<td>-4</td>
<td>0</td>
</tr>
<tr>
<td>GoGn-SN (°)</td>
<td>32</td>
<td>34</td>
</tr>
<tr>
<td>1/SN (°)</td>
<td>113</td>
<td>105</td>
</tr>
<tr>
<td>IMPA (°)</td>
<td>92</td>
<td>82</td>
</tr>
</tbody>
</table>

Discussion

This case illustrates the clinical application of a newly designed appliance named as fixed tongue appliance in the treatment of a 12.1 year-old girl with maxillary deficiency. An exhaustive search of the literature revealed no previous publication of clinical application of fixed tongue appliance for treatment of this malocclusion. In the present case the opening of the mandibular plane angle is a major reason for the CL III correction.

This clinical approach differs from conventional applications, such as facemasks. Maxillary protraction appliances have been used for the treatment of maxillary deficiency. Large extra oral appliances may cause great discomfort for patients and are highly visible to wear, which leads to reduced patient cooperation. Another problem caused by extra oral appliances is that they can cause skin abrasions on the chin especially in hot climates. Therefore patients simply do not wear the appliance and lack of cooperation might lead to an unsatisfactory result. Patients who wear glasses feel uncomfortable with these appliances. Another disadvantage is that, use of a chin cup can lead to lingual tipping of the lower incisors as a result of the pressure of the chin cup component on the lower lip and dentition. In most cases, lingual tipping is an undesirable side effect and can cause crowding.

In a recent study it was also reported that tongue appliance and tongue plate can be used to treat maxillary deficiency. A considerable pressure might be transmitted to the deficient maxilla when the fixed tongue appliance is in the mouth and consequently move it in a forward position. The force of tongue during swallowing and resting posture is transferred through the fixed tongue appliance to the deficient nasomaxillary complex. The considerable force of tongue which is caged behind the cribs moves the maxilla in a forward position. Nevertheless, the vertical length of the cribs should be designed and adjusted in a way to avoid traumatizing the floor of the mouth. It’s noteworthy to mention that the hyrax® screw is for the purpose of loosening the maxillary sutures and extend the width of the maxillary arch and thus creating a better intermaxillary relationship. One of the advantages of fixed tongue appliance is that patient’s cooperation is not needed.

Nevertheless, the appliance used in this study has one disadvantage. It will lingualize the lower incisors due to elimination of tongue pressure on them. However, removal of the fixed tongue appliance will restore the pressure of the tongue on the lower incisors and will consequently result in increase of IMPA. The treatment used in this study was for correction of skeletal problem. Therefore, when the active treatment was finished the patient had to wear the appliance for 3 more months as a retainer and without the need of turning the hyrax® screw.

This study was a preliminary case report and the same approach would have to be repeated on many more patients.

Conclusions

This case report demonstrates a newly designed appliance used to treat a 12.1 year-old girl with a skeletal Class III malocclusion and maxillary deficiency. This appliance was effective in treatment of maxillary deficiency and might be an alternative method to some extra oral appliances such as facemask.

References:


Prof. Jamilian is an orthodontic specialist. He obtained his European Board of Orthodontics in 2013. He is now associate professor of Islamic Azad University, dental branch in Tehran, fellow of Orthognathic surgery and craniofacial syndromes, and a member of craniofacial research center. His practice is limited to orthodontics. He has lectured in several international congresses and has been a consultant for various journals. You can reach him through info@jamilian.net

Prof. Showkatbakhsh has finished his post-graduate training in the school of dental and oral surgery, Colombia University, in New York City in 1981. He has established the first post-graduate program in orthodontics in school of dentistry, Shahid Beheshti medical sciences university. Currently, he is associate professor of the same orthodontic department and director of Orthognathic surgery fellowship.

Dr. Mehrangiz Ghassemi is in the department of Orthodontics, School of Medicine, University of Aachen, Aachen, Germany.

Dr. med. Dr. med. dent. Alireza Ghassemi is a maxillofacial surgeon. He is now associate professor of Aachen University in Germany, and a leading Senior Consultant and Vicechairman of the Department of Oral, Maxillofacial Plastic and Reconstructive Surgery, University of Aachen, Germany. He has published many articles in various international journals.

Dr. Arman Shayan is an orthodontist graduated from Shahid Beheshti University of Medical Sciences.