The use of bonded acrylic expander in patient with open-bite and oral breathing

A. GIANCOTTI, M. GRECO*

ABSTRACT: Aim To show the use of an acrylic expander in the treatment of anterior open bite in patient with maxillary constriction and respiratory concern. Study design Clinical report. Setting “Fatebenefratelli” Hospital (Italy). Material and method The open bite treatment represents a challenge for orthodontists because it is determined by several complementary factors such as: adenoid reduction, tongue posture, maxillary constriction etc. In order to correct the open bite, oral breathing and crowding, a bonded acrylic expander was used, avoiding patient cooperation. Results The treatment was successfully completed, the open bite was corrected spontaneously by incisors eruption, the maxillary crowding was solved and the patient breathing was normalised. No cooperation was requested to the patient except oral hygiene. Conclusion We can conclude that in these patients the use of a simple expander with vertical control of skeletal pattern could lead to successful and stable outcome.

KEYWORDS: Maxillary constriction; Oral breathing; Open bite.

Introduction

Open bite can be considered as one of the most difficult malocclusion to treat, in children as well as in adult patients. Several aetiological conditions can be related to the anterior open bite malocclusion such as: hyperdivergent growth pattern, oral breathing, sucking habits, orofacial and lingual activity factors, eruptive and occlusal forces. The complexity of factors involved in the anterior open bite and the difficulties encountered to achieve stable results have led to several researches to determine the causes [Lopatiené and Babarskas, 2002; Pedra et al., 2006; Shpak et al., 2006].

Ricketts stated that the main characteristics of respiration obstruction syndrome are the presence of hypertrophied tonsils or adenoids, mouth breathing, open bite, crossbite and narrow external nares [Ricketts, 1968].

Tomer indicated that children with mouth breathing develop a V-shape maxillary arch with consequent crowding in the upper arch, associated with nasal obstruction due to hypertrophied adenoid and tonsils, chronic and allergic rhinitis, and congenital nasal deformities [Tomer, 1982].

Linder Aronson stated that increased adenoids aggravate nose breathing, which disrupts the balance of lingual, labial and cheek muscles [Linder Aronson et al., 1993].

More recent studies showed that mouth breathing also influences the increase of the lower third of the face, mandibular rotation and excessive mandibular angle [Vickers, 1998].

Vig et al found that patients with long vertical face height had higher nasal resistance when compared with normal patients [Vig et al., 1981; Vig, 1998].

O’Ryan in a critical literature review found that mouth breathing resulting from nasal obstruction is not always related to development of long face syndrome but only in maxillary constriction [O’Ryan et al., 1992].

Further experimental studies have been done to assess the consequence of induced nasal obstruction in animals and the effects were a narrowed maxilla, with subsequent crowding in the upper arch, a lowered posture of the mandible and increased vertical face height [Harvold et al., 1981; Schlenker et al., 2000].
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According to Proffit, the ideal period to begin treatment is the mixed dentition because every modifications in deciduous dentition could relapse due to continuous growth changes [Proffit and Fields, 1983].

The aim of this work is to present the clinical approach in treating a case of Class I malocclusion with anterior open bite and maxillary constriction; the patient showed mouth breathing and finger sucking habits.

**Diagnosis and treatment plan**

The patient, a 9 years old girl, presented with Class I malocclusion, maxillary constriction in mixed dentition and crowding in the upper and lower arches. She showed an anterior open bite with subsequent loss of incisal overlap and lingual interposition during speech and deglutition (Fig. 1). Considered that very often mouth breathing is related to nasal obstruction, the patient underwent otorhinological exam in order to assess the nasal resistance. A rhinomanometry test and a posterior pharyngoscopy were performed; the nasal airflow as well as tonsils and adenoids resulted in a normal range attesting no nasal obstruction. For this reason the otorhinolaryngologist decided there was no need of treating. The cephalometric analysis showed a normal divergence growth pattern with a slight tendency to hyperdivergency, a facial anterior height alteration with a negative overbite of 5 mm. The loss of incisal overlap is conspicuous when looking at the patient smiling in profile (Fig. 2).

**Treatment**

The treatment plan was to correct the maxillary constriction by means of a bonded acrylic expander to prevent the mandibular clockwise rotation and to
allow spontaneous incisors extrusion in order to eliminate the open bite.

During the application of the acrylic expander only the vestibular and lingual surfaces of the lateral teeth were acid etched and bonded, while the occlusal surface was not treated. The expander activation was performed by patients’ parents and lasted 15 days (Table 1, Fig. 3).

### Table 1 - Expander activation setup.

<table>
<thead>
<tr>
<th>1st day</th>
<th>2nd to 15th day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activation</td>
<td>2 mm</td>
</tr>
</tbody>
</table>

Results

At the end of treatment, after 13 months the anterior open bite was completely corrected and the transverse dimension restored. The rotation of maxillary central incisors was also improved by means of the removable appliance (Fig. 4).

The 5 mm. dental open bite was corrected after 7 months of treatment (Fig. 5). A slight overcorrection occurred and remained stable at 10 months of post-retention (Fig. 6). The maxillary arch was expanded of about 5 mm: the intermolar diameter varied from 36 mm to 41 mm and the intercanine diameter from 29 mm to 33 mm. The sucking habit was spontaneously corrected thanks to the presence of the appliance.
Neither clenching exercise nor rehabilitation therapy were prescribed.

**Discussion**

Several articles report that the traditional maxillary expander device contributes to increase the vertical face dimension and bite opening due to posterior rotation of the mandible, buccal tipping of lateral segments and cuspal interferences. Other more specific studies compared the effects of traditional maxillary expander to those of bonded acrylic expander and showed that the acrylic expander can better control the vertical effects of the maxillary expansion by the resin bite plane on which the heavy occlusal forces are exerted [Asanza et al., 1997; Chung and Font, 2004].

To treat the complexity of factors involved in the open bite different approaches have been proposed such as functional appliances or exercises associated to RME (bionator, lingual spurs, molars extraction, clenching exercise) all requiring various degrees of patient compliance [Bascifìci and Karaman, 2002; Conley and Legan, 2002].

According to these literature findings we decided to use an acrylic expander in order to prevent worsening of the anterior open bite after a careful assessment of nasal airflow by the otorhinolaryngologist. Another treatment goal was to reduce the upper crowding by means of arch expansion allowing lateral incisors to erupt, and to improve the nasal breathing without any other functional or more invasive appliance which requires patient’s high compliance.

Post-treatment dental analysis showed that the transverse diameter was re-established (5 mm expansion), the crowding was corrected as well as the open bite (from -4 mm to 3 mm) only by using the same appliance (Fig. 7). The alignment of central
incisors was improved and lateral incisors eruption could take place. Obviously, in order to complete the treatment a second phase with fixed appliance will be planned in late mixed dentition.

The post-treatment cephalometric analysis shows little growth downwards and forward in 12 months of treatment and a favourable change in the occlusal plane. The posterior teeth were maintained in the same position while the incisors extruded (1/ANS-PNS varied from 114° to 104°) following the maxillary growth and the loss of occlusal contacts (Fig. 8, Table 2).

The aesthetic improvement is evident on smiling due to the correction of incisors exposition and consequent well-balanced lip posture.

**Conclusion**

The use of resin expander in patients with dental open bite and maxillary constriction could be considered successful in both transverse and vertical dimension, and seems to be stable in the long term. No invasive appliances (such as spurs) have been

### Table 2 - Cephalometric values before and after treatment.

<table>
<thead>
<tr>
<th>Category</th>
<th>Mean SD</th>
<th>Pre-Treatment</th>
<th>Post-Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sagittal Skeletal Relations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maxillary Position S-N-A</td>
<td>82° ±3.5</td>
<td>82°</td>
<td>83°</td>
</tr>
<tr>
<td>Mandibular Position S-N-PG</td>
<td>80° ±3.5</td>
<td>79°</td>
<td>79°</td>
</tr>
<tr>
<td>Sagittal Jaw Relation A-N-PG</td>
<td>2° ±2.5</td>
<td>3°</td>
<td>4°</td>
</tr>
<tr>
<td><strong>Vertical Skeletal Relations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maxillary Inclination S-N/ANS-PNS</td>
<td>8°±3.0</td>
<td>7°</td>
<td>5°</td>
</tr>
<tr>
<td>Mandibular Inclination S-N/GO-GN</td>
<td>33°±2.5</td>
<td>32°</td>
<td>30°</td>
</tr>
<tr>
<td>Vertical Jaw Relation ANS-PNS/GO-GN</td>
<td>25°±6.0</td>
<td>28°</td>
<td>26°</td>
</tr>
<tr>
<td><strong>Dento-basal Relations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maxillary Incisor Inclination 1/ANS-PNS</td>
<td>110°±6.0</td>
<td>114°</td>
<td>104°</td>
</tr>
<tr>
<td>Mandibular Incisor Inclination 1 / GO-GN</td>
<td>94±7.0</td>
<td>91°</td>
<td>91°</td>
</tr>
<tr>
<td>Mandibular Incisor Compensation 1/ A-PG (MM)</td>
<td>±±2.0</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td><strong>Dental Relations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overjet (MM)</td>
<td>3.5±2.5</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Overbite (MM)</td>
<td>2±2.5</td>
<td>-4</td>
<td>3</td>
</tr>
<tr>
<td>Interincisal Angle 1 / 1</td>
<td>132°±6.0</td>
<td>130°</td>
<td>140°</td>
</tr>
</tbody>
</table>
necessary and during the whole treatment the appliance was well tolerated by the patient.

References