A retrospecive analysis of 20 surgically corrected bimaxillary protrusion patients

This paper presents a retrospective review and analysis of 20 bimaxillary protrusion patients who visited the authors’ hospital between 1986 and 1998 following surgical correction. The lateral cephalometric radiographs of each patient were taken preoperatively (T₀), within 1 week after surgery (T₁), and at least 1 postoperative year later (T₂). Hard and soft tissue analysis was performed on each cephalometric radiograph. The matched pair t test was employed for T₀–T₁, T₁–T₂, and T₀–T₂ periods. The sample consisted of 20 Korean adult patients with bimaxillary protrusion (18 women and 2 men), aged 21 to 33 years. The first premolars were removed in 18 of the 20 cases. The Wunderer method was selected in 18 of the 20 maxillary cases, and the anterior subapical osteotomy was selected in all mandibular cases. Augmentation genioplasty was combined in 3 cases, and reduction glossoplasty was combined in 2 cases. Orthodontic treatment was accompanied in 8 cases. The statistical analysis of all the variables revealed that, except for overbites, there were significant differences between T₁–T₂ and between T₀–T₂ periods (P < .01). This suggests that most of the bimaxillary patients want instant esthetic facial results and that their soft tissue profiles were improved significantly. However, the postoperative course should be cautiously observed. (Int J Adult Orthod Orthognath Surg 2002;17:23–27)
Patients and methods

The sample consists of 20 adult Korean patients with bimaxillary protrusion who visited the Pusan National University Hospital between 1986 and 1998. All patients were treated for the correction of bimaxillary protrusion by anterior segmental osteotomies with the extraction of either the first or the second premolars. Augmentation genioplasty was combined in 3 cases, and orthodontic treatment was accompanied in 8 cases.

Lateral cephalometric radiographs were taken in centric occlusion with the lips in repose and with the same cephalometer. The radiographs were taken preoperatively (T₀), within 1 week postoperatively (T₁), and at least 1 year postoperatively (T₂) for each patient.

The cephalometric analysis was done by the same researcher and included 12 landmarks and reference lines, as defined by Holdaway² (Fig 1). To assess the systematic and accidental errors of the cephalometric analysis, 50 randomly selected cephalograms were retraced, redigitized, and calculated using Dahlberg’s formula for each variable.¹⁰,¹¹ Eight specific measurements were selected to evaluate the hard and soft tissue changes from presurgery to postsurgery (Table 1). The matched pair t test was used for T₀–T₁, T₁–T₂, and T₀–T₂ periods.

### Table 1: Measurements made in the study

<table>
<thead>
<tr>
<th>Parameter</th>
<th>T₀</th>
<th>T₁</th>
<th>T₂</th>
<th>T₀–T₁ (t)</th>
<th>T₁–T₂ (t)</th>
<th>T₀–T₂ (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interincisal angle (deg)</td>
<td>107.7 ± 8.6</td>
<td>127.4 ± 7.1</td>
<td>125.3 ± 7.5</td>
<td>−13.564**</td>
<td>4.663**</td>
<td>−10.673**</td>
</tr>
<tr>
<td>Overbite (mm)</td>
<td>1.7 ± 2.7</td>
<td>2.5 ± 1.0</td>
<td>2.2 ± 1.2</td>
<td>−1.608</td>
<td>2.442*</td>
<td>−1.094</td>
</tr>
<tr>
<td>Overjet (mm)</td>
<td>4.4 ± 2.4</td>
<td>2.9 ± 1.1</td>
<td>3.6 ± 1.7</td>
<td>3.348**</td>
<td>−2.933**</td>
<td>2.073*</td>
</tr>
<tr>
<td>U₁ to F plane (mm)</td>
<td>16.3 ± 3.9</td>
<td>7.4 ± 3.7</td>
<td>8.1 ± 4.0</td>
<td>4.834**</td>
<td>−2.689**</td>
<td>4.657**</td>
</tr>
<tr>
<td>L₁ to F plane (mm)</td>
<td>11.9 ± 4.8</td>
<td>4.4 ± 3.2</td>
<td>4.8 ± 3.3</td>
<td>12.637**</td>
<td>−2.636**</td>
<td>13.592**</td>
</tr>
<tr>
<td>H ratio</td>
<td>10.8 ± 8.6</td>
<td>2.2 ± 1.1</td>
<td>2.6 ± 1.5</td>
<td>11.841**</td>
<td>−3.405**</td>
<td>11.676**</td>
</tr>
<tr>
<td>Nasolabial angle (deg)</td>
<td>91.8 ± 11.3</td>
<td>104.8 ± 7.6</td>
<td>16.2 ± 2.1</td>
<td>−6.894**</td>
<td></td>
<td>11.833**</td>
</tr>
<tr>
<td>H angle (deg)</td>
<td>24.7 ± 3.3</td>
<td>16.2 ± 2.1</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**U₁ and L₁ to F plane = upper and lower central incisors to the facial plane; H ratio = Holdaway ratio, calculated using the formula 1-NB*/Pog-NB; H angle = Holdaway angle; T₀ = taken preoperatively; T₁ = taken within 1 week postoperatively; T₂ = taken at least 1 year postoperatively. Values are given as mean ± SD. The matched pair t test was used for the statistical analysis for periods T₀–T₁, T₁–T₂, and T₀–T₂.**

*P ≤ .05.

**P ≤ .01.

Fig 1  Cephalometric landmarks and hard and soft tissue measurements used in this study: S = sella; N = nasion; Sn = subnasale; Ls = labrale superioris; Pog = pogonion; B = suprumentale; Ii = incision inferius; Is = incision superius; Ap₁ = apicale 1; ApT = apicale T; IIA = interincisal angle; NLA = nasolabial angle; H ratio = Holdaway ratio (1-NB*/Pog-NB*); H angle = Holdaway angle. A prime mark indicates a soft tissue landmark.
Results

The 20 bimaxillary patients were composed of 18 women and 2 men. Their anterior teeth were relatively well aligned. Yet there were 5 cases of gummy smiles, 5 of deep bites, 4 of open bites, 13 of severe overjets, and 2 of anterior diastema. The patients’ mean age was 27 years, with the range being 21 to 33 years. The first premolars were removed in 18 cases, and the second premolars were removed in 2 cases. For the retraction of the anterior maxillary segment, we used the Wunderer method in 18 cases, with interincisal osteotomy in 1 of the 18 cases; we also used the Wassmund method in 1 case and the Cupar method in 1 case with interincisal osteotomy. Anterior segmental osteotomy was performed in all mandibular cases, and interincisal osteotomy in 2 cases. Augmentation genioplasty was combined in 3 cases, and reduction glossoplasty was combined in 2 cases. Orthodontic treatment was performed in 8 cases. Postoperative complications were composed of wound dehiscence in 2 cases and lower lip paresthesia in 3 cases.

In a statistical analysis of all the independent variables, there were significant differences at the T0–T2 period (P < .01), except for overbites. There were significant changes in the underlying hard tissue following the surgical correction of the bimaxillary protrusion. The interincisal angle was increased by a mean of 17.6 degrees during the T0–T2 period. The overbite and the overjet were reduced by a mean of 0.5 mm and 0.8 mm, respectively. During the T0–T2 period, the maxillary and the mandibular incisors were respectively retracted by a mean of 8.2 mm and 7.1 mm. During the T0–T2 period, the Holdaway ratio was reduced by a mean of 8.2. Also, during the T0–T2 period, a soft tissue analysis revealed that the nasolabial angle was increased by 13.0 degrees, and the Holdaway angle was reduced by a mean of 8.5 degrees. On the other hand, all the independent variables analyzed during the T1–T2 period were found to be statistically significant (P < .01; Table 1).

Discussion

The distribution of the subjects’ gender and their mean age revealed that mostly female patients seek this treatment, and they are usually at the period beyond active orthodontic treatment. Also, female patients want more facial esthetic results than dental esthetic ones, as indicated by the fact that only 8 of the 20 cases combined with orthodontic treatment. However, in all circumstances, clinicians must attempt to obtain the best facial esthetics without compromising dental esthetics and function.

Prior to surgery, teeth to be extracted are selected, considering the shape of both the arch and the alignment of the anterior teeth. The first premolars are usually the choice of extraction, as shown by our results. However, to avoid a severe buccal step difference, additional surgery such as interincisal osteotomies or the extraction of second premolars may also be considered. For the retraction of the anterior maxillary segment, 1 of 3 surgical approaches—the Wassmund method, the Wunderer method, or the Cupar method—is selected. The Wassmund method provides an excellent dual vascular supply to the anterior maxillary segment. However, with this method, it is technically more difficult to gain access to the superior and the palatal aspects of the anterior maxilla, and final adjustments to activate the preplanned occlusion may be difficult. For this reason, we used the Wunderer method as the dominant procedure for the retraction of the anterior maxillary segment in 18 cases. We used the Cupar method in only 1 case, a case of a moderate gummy smile.

Despite the apparent clinical success of the Wunderer method, fatal postoperative complications such as necrosis of the anterior teeth and segments, and the ankylosis of the canine teeth may occur. In the current study, such sequelae did not occur, except for mild complications such as wound dehiscence at the osteotomy site and temporary lower lip paresthesia. Therefore, we speculate that this surgical approach is a safe and predictable procedure.
All the independent variables, except for overbites, analyzed during the $T_1$–$T_2$ periods were found to be statistically significant ($P < .01$), including overjets ($P < .05$). The interincisal angle was increased by a mean of 19.02 degrees, ranging from 12.2 degrees to 20 degrees. Our measured value was increased by a mean of 17.6 degrees, whereas Finnog et al. reported that it was increased by only 9.80 degrees after orthodontic treatment of Caucasian subjects whose anterior teeth were more upright than our subjects. The overbite was increased by 0.5 mm, and the overjet was reduced by 0.8 mm; these are similar to the values reported by Keating. However, the change in the overbite was statistically insignificant during the $T_1$–$T_2$ periods. Nadkarni reported that the nasolabial angle was increased by 10.55 degrees following orthognathic surgery in a sample of Indian patients. Our results increased by 11.2 degrees, similar to Nadkarni’s results. In contrast, some authors have reported an increase in the nasolabial angle, ranging from 6.5 to 8.9 degrees, following orthodontic treatment. We speculate that the nasolabial angle was slightly more increased in surgically treated cases than in orthodontically treated cases. Also, while Lew reported that the increased nasolabial angle of almost 90 degrees approached the normal values of Chinese people, Farrow et al. found that a slightly more convex profile instead of Caucasian orthodontic norms was the most attractive for 15 African American patients. Our value, 104.8 ± 7.6 degrees, supports Farrow’s results more than those of Lew.

On the other hand, all the independent variables analyzed during the $T_1$–$T_2$ period were significant ($P < .01$), including overbites ($P < .05$). This indicates that postoperative relapses occurred in both soft and hard tissues. Therefore, although teeth stability in a new position is usually obtained by lip pressure and not tongue pressure, reduction glossoplasty was performed in 2 cases with functional macroglossia.

In summary, most bimaxillary patients want facial esthetic results instantly without orthodontic treatment and have improved profiles greatly following surgical correction. Otherwise, this suggests that clinicians should pay more attention to postoperative course.
References