Definitive Surgical-Orthodontic Treatment to Correct the Problems Subsequent to Early Skeletal Class III Camouflage

Siripatra Patchanee
Department of Craniofacial Orthodontics, Chang Gung Memorial Hospital, Taipei, Taiwan; Graduate Institute of Dental and Craniofacial Science, Chang Gung University, Taoyuan, Taiwan; Faculty of Dentistry, Thammasat University (Rangsit Campus), Pathumthani, Thailand

Ellen Wen-Ching Ko
Department of Craniofacial Orthodontics, Chang Gung Memorial Hospital, Taipei, Taiwan; Graduate Institute of Dental and Craniofacial Science, Chang Gung University, Taoyuan, Taiwan; Craniofacial Research Center, Chang Gung Memorial Hospital, Linkuo, Taiwan, ellenko.wc@msa.hinet.net

Cheng-Hui Lin
Craniofacial Research Center, Chang Gung Memorial Hospital, Linkuo, Taiwan; Department of Plastic and Reconstructive Surgery, Chang Gung Memorial Hospital, Taoyuan, Taiwan

Follow this and additional works at: https://www.tjo.org.tw/tjo

Part of the Orthodontics and Orthodontology Commons

Recommended Citation
DOI: 10.30036/TJO.201706_29(2).0005
Available at: https://www.tjo.org.tw/tjo/vol29/iss2/5

This Case Report is brought to you for free and open access by Taiwanese Journal of Orthodontics. It has been accepted for inclusion in Taiwanese Journal of Orthodontics by an authorized editor of Taiwanese Journal of Orthodontics.
Definitive Surgical-Orthodontic Treatment to Correct the Problems Subsequent to Early Skeletal Class III Camouflage

Cover Page Footnote
We express our sincere thanks to our colleague, Mr. Cheng-Wei Chen, for his valuable assistance in the surgical simulation techniques.

This case report is available in Taiwanese Journal of Orthodontics: https://www.tjo.org.tw/tjo/vol29/iss2/5
DEFINITIVE SURGICAL-ORTHODONTIC TREATMENT TO CORRECT THE PROBLEMS SUBSEQUENT TO EARLY SKELETAL CLASS III CAMOUFLAGE

Siripatra Patchanee,1,2,5 Ellen Wen-Ching Ko,1,2,3 Cheng-Hui Lin,3,4

1 Department of Craniofacial Orthodontics, Chang Gung Memorial Hospital, Taipei, Taiwan
2 Graduate Institute of Dental and Craniofacial Science, Chang Gung University, Taoyuan, Taiwan
3 Craniofacial Research Center, Chang Gung Memorial Hospital, Linkuo, Taiwan
4 Department of Plastic and Reconstructive Surgery, Chang Gung Memorial Hospital, Taoyuan, Taiwan
5 Faculty of Dentistry, Thammasat University (Rangsit Campus), Pathumthani, Thailand

This case report describes the treatment of a 21-year-old female patient who was disappointed with the outcome of a previous orthodontic treatment and complained about her chin prominent. She had skeletal Class III malocclusion with concave facial profile, hypodivergent facial pattern with deep overbite. The previous Class III camouflage orthodontic treatment was done by teeth 34, 44 extraction since she was 12 years old. With the concept of surgery-first approach, the surgical treatment plan included LeFort I osteotomy clockwise rotation of maxilla and bilateral sagittal split ramus osteotomy backward rotation of mandible with genioplasty and angle reduction in order to increase lower facial height. With non-extraction therapy, the molars were finished in full Class III relation. The 3D surgical simulation showed overall pogonion movement was backward 8.3 mm and downward 5.2 mm which corresponded to post-operative clinical result. As post-surgical orthodontic phase treatment done, the results showed that deep overbite was corrected and facial esthetics greatly improved after about one year of treatment.

We report the successful facial esthetic case resulting in motivated patient comfort and psychosocial satisfaction. This clinical case report could be beneficial to demonstrate the corrective treatment of choice in patient who required to improve facial esthetic and function. (Taiwanese Journal of Orthodontics. 29(2): 108-117, 2017)

Keywords: orthognathic surgery; surgery-first approach; skeletal Class III malocclusion

Received: April 25, 2017  Revised: June 21, 2017  Accepted: June 23, 2017
Reprints and correspondence to: Dr. Ellen Wen-Ching Ko, Department of Craniofacial Orthodontics, Chang Gung Memorial Hospital, Taipei, Taiwan
199, 6F, Tung Hwa North Road, Taipei 105, Taiwan
Tel: +886-2-27135211 Ext. 3533  Fax: 886-2-5148246  E-mail: ellenko.wc@msa.hinet.net
INTRODUCTION

Nowadays, aesthetic has become an additional requirement for orthognathic surgery which both orthodontists and surgeons should really carefully evaluate further than function.\(^1\)\(^2\) A prominent chin in sagittal projection would enhance a squared and concave profile of face and proved to be less attractive especially in female patients as it creates more muscular and stronger face.\(^3\) Previous studies found that chin protrusion requires surgical correction which usually carry through genioplasty.\(^4\)\(^6\)

Surgery-first approach (SFA) becomes spread well known treatment method for orthognathic surgery patients. Without pre-operative orthodontic decompensation phase, the accelerated orthodontic tooth movement phenomenon has significantly reduced total treatment time. An immediately facial profile improvement at the start of treatment can increase patient compliant and psychosocial aspect.\(^7\)\(^8\)

This case report was to illustrate the concept of SFA and the treatment alternatives and treatment outcome for deep overbite and prominent chin correction after early camouflage treatment of skeletal Class III malocclusion.

CASE REPORT

A twenty-one years old Taiwanese lady came to our department with the complaint of chin prominent. She denied any systematic disease and history according to temporomandibular disorder. Her previous dental history was routine dental care and orthodontic treatment with lower first premolars extraction since she was 12.

Diagnosis and etiology

The patient had skeletal Class III relationship with hypodivergent facial pattern and chin prominent. The lips competence was observed and shown quite properly position. Shorter lower facial height and no mentalis muscle strain. Mild chin deviation of 2 mm was observed. When smiling, the incisor-stomion distance was 7 mm or 70% with no gummy smile. Her smile arc was flat and paranasal depression also noticeable. Her lateral profile was concave with average nasolabial angle. The upper and lower lips were retrusive to Ricket E-line. The more chin prominent and retroclination of lower incisors caused by previously orthodontic camouflage treatment resulted in deep labiomental fold which was her concern (Figure 1).

The dental was Angle’s Classification III malocclusion with a deep overbite of 5 mm and a positive overjet of

Figure 1. Pretreatment facial photographs.
4 mm. The facial and dental midline were coordinated. Both upper and lower arch were symmetric u-shape with mild crowding. The lower first premolars (34, 44) were extracted and closed spaces. Her upper incisors were proclined and up righted on lower incisors. There was no occlusal plane cant (Figure 2).

The radiographic examination was done by panoramic view, lateral cephalometric and posteroanterior (PA) cephalometric films for screening and diagnosis. In addition, cone beam computed tomography was done for further 3D simulation for surgical planning. There were partially bony impaction on maxillary right third molar and no pathologic finding on bilateral maxillary sinus and dentoalveolar area. The bilateral condylar remodeling with shorter left condyle corresponded with the mild left sided chin deviation (Figure 3).

Figure 2. Pretreatment intraoral photographs.

Figure 3. Pretreatment lateral and PA cephalometric and panoramic radiographs.
Treatment Objectives

The overall problem lists of this patient were mostly depended on her skeletal problems which were chin deviation, low mandibular plane angle which corresponded to short lower facial height and large gonial angle. In sagittal part, which were mainly in her complaint were chin prominent and deep labiomental fold. In order to achieve patient satisfaction, all these treatment objectives were addressed

1. For maxilla: Correct the insufficient dentogingival display and improve paranasal depression.

2. For mandible: Increase her lower facial height, correct and reduce bilateral gonial angle and chin contour.

3. Dentition: Level and align for relieving dental compensation, coordinate with facial midline and achieve proper teeth interdigitating and overjet-overbite relationship.

Treatment Alternatives

The treatment options were

1. Genioplasty for reduction the chin contour without orthodontic treatment. This option can have benefit in terms of less invasive surgical operation and reduce cost of treatment. However, according to her initially limited space between lower incisors root apex and genial tubercle, the genioplasty would produce minimal changes for her facial profile.

2. Two jaw surgery combined with orthodontic treatment to clockwise rotate the maxillomandibular complex (MMC) to achieve facial esthetic and dental function.

Both of the treatment alternatives including risk and benefit were well explained to patient and her family. She designed for two jaw surgery as it would provide better esthetic and function.

Treatment Progress

The treatment plan was surgery first combined with orthodontic approach. Surgical treatment objective (STO) was done from lateral cephalometric radiographic for tentative surgical plan and then the final surgical treatment plan was done by 3D simulation software (Simplant O&O®) in order to evaluate concise of pitch, roll and yaw movement. The initial CBCT file was oriented and adjusted head position by aligning the inter-orbitale line which defined as a line connected the most inferior point of right and left infraorbital rim. The perpendicular plane to inter-orbitale line was adjusted according to Frankfort horizontal plane that connected between porion and orbitale. The vertical reference plane was constructed by using a perpendicular plane to Frankfort horizontal plane that pass through nasion and basion. After landmarks identification, the MMC was moved and adjusted according to those reference planes. The maxilla was LeFort I osteotomy with clockwise rotation, the mandible was bilateral sagittal split ramus osteotomies with clockwise rotation and geniplasty as well as bilateral gonial angle recontouring (Figure 4). The surgical stent was double stent technique. The intermediate surgical stent was designed in Geomagic software® and printed out by 3D printing technology. The final stent was done by conventional self-cure acrylic technique.

Full mouth bonding with pre-adjusted self-ligating bracket 0.022-in slot and surgical stent try in to confirm the best fitted position. The maxillary and mandibular 0.014-in nickle-titanium archwires were placed. Five days after full mouth bonding, the patient undergone two jaws surgery following as plan (Figure 4). Finally, all the facial contour were re-evaluated and reshaped intra-operation for the perfect facial balanced and harmonious outcome. Rigid internal fixation by screw and miniplate were used both in maxilla and mandible. The intermaxillary fixation was done by light elastic band for one-week period.

The patient was recalled for evaluation one month after the surgery. An excellent postsurgical outcome with the immediate improvement of her facial profile was achieved even though the moderate swelling was
presented. In addition, both upper and lower dental midline were coordinated with patient’s facial midline. The overjet was +2 mm and overbite was +3 mm (Figure 5). The maxillary and mandibular 0.016x0.022-in stainless steel archwires were used for finishing and detailing on the fourth month after surgery. After finishing and detailing in Class I canine and Class III molar relation, the retention was done by fixed and removable retainers with lower posterior supporting plate to prevent upper second molar extrusion.

Figure 4. 3D Surgical planning.

Figure 5. Extraoral and intraoral photographs for one-month post-surgical result.
Treatment Results

Straight facial profile and obviously reduced chin prominent were achieved. Postoperative panoramic film show good bony healing and no further condylar resorption after debond. All surgical segments were stable.

In superimposition of cephalometric analysis and 3D skull superimposition constructed from initial and debonding CBCT file with a surface based registration at the cranial fossa and the frontal bone, the mandible was setback and clockwise rotation. The maxilla was clockwise rotated by moving posterior segment upward by 4 mm (Figure 6). The upper incisors proclination was reduced and advanced more on lips position. The pogonion point was moved backward by 8 mm and downward by 5 mm resulted in straightening facial profile. Also, lower facial height was increased (Table 1). The genioplasty and bilateral gonial angle resection can produce a better harmonious face (Figure 7).

DISCUSSION

This case report was demonstrated the result of clockwise rotation of MMC by SFA in order to correct protrusive chin with hypodivergent facial pattern and flat smile arc.

The previous result of Class III camouflage treatment with the lower bilateral premolars extraction in this case revealed the same as previous literature. The more uprighting of lower incisors while increasing proclination of upper incisors caused increasing overjet and deepening the bite while lower lip was found more retrusive compared to E-line. Another literature published result comparing early Class III camouflage and untreated control groups. They found that camouflage treatment did not result in improvement in the sagittal jaw relationship and the jaw relationships became worse with treatment.
Table 1. Cephalometric summary.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Initial 2015/07/28</th>
<th>1 Month postop 2015/09/30</th>
<th>Debonding 2016/08/25</th>
<th>Norm</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNA (°)</td>
<td>86</td>
<td>87</td>
<td>87</td>
<td>82.5 + 3.6</td>
</tr>
<tr>
<td>SNB (°)</td>
<td>90</td>
<td>88</td>
<td>88</td>
<td>79.7 + 3.9</td>
</tr>
<tr>
<td>ANB (°)</td>
<td>-4</td>
<td>-1</td>
<td>-1</td>
<td>2.8 + 1.5</td>
</tr>
<tr>
<td>A-Nv (mm)</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>-1.1 + 2.9</td>
</tr>
<tr>
<td>Pg-Nv (mm)</td>
<td>14</td>
<td>5</td>
<td>6</td>
<td>-4.0 + 5.3</td>
</tr>
<tr>
<td>AO-BO (mm)</td>
<td>-3</td>
<td>-2</td>
<td>-2</td>
<td>-2.0 + 3.4</td>
</tr>
<tr>
<td>SN-FH (°)</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>5.7 + 3.5</td>
</tr>
<tr>
<td>SN-MP (°)</td>
<td>20</td>
<td>26</td>
<td>26</td>
<td>33.0 + 4.2</td>
</tr>
<tr>
<td>UFH/LFH (%)</td>
<td>50 / 50</td>
<td>45 / 55</td>
<td>45 / 55</td>
<td>45 / 55</td>
</tr>
<tr>
<td>U1-SN (°)</td>
<td>124</td>
<td>110</td>
<td>112</td>
<td>104.7 + 7.8</td>
</tr>
<tr>
<td>L1-MP (°)</td>
<td>84</td>
<td>90</td>
<td>92</td>
<td>92.5 + 4.7</td>
</tr>
<tr>
<td>U1-L1 (°)</td>
<td>136</td>
<td>130</td>
<td>124</td>
<td>129.8 + 8.3</td>
</tr>
<tr>
<td>U1-NA (mm)</td>
<td>9</td>
<td>6</td>
<td>7</td>
<td>4.3 + 2.2</td>
</tr>
<tr>
<td>U1-NA (°)</td>
<td>36</td>
<td>28</td>
<td>31</td>
<td>21.9 + 6.5</td>
</tr>
<tr>
<td>L1-NB (mm)</td>
<td>2</td>
<td>1.5</td>
<td>2</td>
<td>4.0 + 1.8</td>
</tr>
<tr>
<td>L1-NB (°)</td>
<td>13</td>
<td>24</td>
<td>25</td>
<td>26.0 + 4.0</td>
</tr>
<tr>
<td>L1-NPog (mm)</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>6.4 + 2.7</td>
</tr>
<tr>
<td>NLA (°)</td>
<td>89</td>
<td>85</td>
<td>100</td>
<td>92.9 + 7.4</td>
</tr>
<tr>
<td>UL-E line (mm)</td>
<td>-5</td>
<td>0</td>
<td>-2</td>
<td>1.8 + 1.5</td>
</tr>
<tr>
<td>LL-E line (mm)</td>
<td>-6</td>
<td>-2</td>
<td>-3</td>
<td>1.9 + 1.1</td>
</tr>
</tbody>
</table>
Figure 7. Posttreatment photographs and radiographs at the time of debond (12 month after surgery).
because of disproportional growth of the maxilla and the mandible. In addition, more teeth extrusion in the camouflage group, so the occlusal plane was counter clockwise rotation changes. If the effect from incisor extrusion much more than molar extrusion, the result in the over bite could be more increased.\textsuperscript{11}

Stability is proved to be greatest when soft tissues are relaxed during in two jaw surgery.\textsuperscript{12} The treatment design showed posterior maxilla was impacted while ANS was used to be center of rotation and also mandibular setback. All previously mentioned procedure result in relaxation of soft tissue and muscular function which can increase in postoperative skeletal stability. The surgical clockwise rotation of MMC technique indicated in patients who require esthetic such as low mandibular plane angle. This technique of rotation result in increased occlusal plane angle can improve smile arc for the patients who had less gum shown. Advancing mandibular incisors while the pogonion point rotated backwards in order to reduce chin prominence.\textsuperscript{13}

For her main complaint of deep labiomental fold and chin prominent, nowadays many treatment alternative can be considered. In cosmetically approach, injectable filling agents and implant techniques could work well in restoration of lower face wrinkles and folds. Still, there are some unwanted side effect. Also proper concentration and injection technique are the key factors for its longevity.\textsuperscript{14} By the era of the stem cell technology, autogenous fat grafting provides further benefit. However, its short duration effect and technical sensitivity need more improvement for clinically friendly used.\textsuperscript{15} The most appropriated choice of treatment we had chosen was surgically approach. The same agreement with study in 2011 for short and square lower face patient. Narrowing and sliding genioplasty combined with a mandibular outer cortex ostectomy could provide balanced and harmonious outcomes.\textsuperscript{16} In addition, genioplasty can produce greater reduction of lower lip length and narrowing of mentolabial angle and proved to enhance the aesthetics and quality of life in general.\textsuperscript{17}

CONCLUSIONS

The decision for extraction in early camouflage orthodontics is a challenging one and should be carefully addressed. If an improvement in appearance is a major goal of treatment, it makes sense that beside the jaws and teeth, changes in facial soft tissue contours that could be produced by facial plastic surgery, should also be considered in the treatment planning. The integration of orthognathic and facial plastic surgery is a current and entirely rational trend.

Acknowledgements

We express our sincere thanks to our colleague, Mr. Cheng-Wei Chen, for his valuable assistance in the surgical simulation techniques.

REFERENCES


