2020

Use Improved Super-elastic Ti-Ni Alloy Wire to Correct Class II Division 2 Malocclusion with Unstable Mandibular Position

Yu-Cheng Lo  
*Department of Orthodontics, China Medical University Hospital Medical Center, Taiwan*

Yuan-Hou Chen  
*Department of Orthodontics, China Medical University Hospital Medical Center, Taiwan*

Hsien-Hsiung Chiang  
*Department of Orthodontics, China Medical University Hospital Medical Center, Taiwan*

Jian-Hong Yu  
*Department of Orthodontics, China Medical University Hospital Medical Center, Taiwan; School of Dentistry, College of Dentistry, China Medical University, Taichung, Taiwan, kenkyu@hotmail.com*

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**Recommended Citation**

DOI: 10.30036/TJO.201810_31(3).0006  
Available at: [https://j.tjo.org.tw/tjo/vol30/iss3/6](https://j.tjo.org.tw/tjo/vol30/iss3/6)

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INTRODUCTION

Characteristic facial features of Class II division 2 malocclusion (Class II/2) are an obtuse interincisal angle, retruding lips, a gummy smile, and a concave and shortened lower third of the face. Oral examination commonly reveals a deep bite, retroclined maxillary central incisors, and anterior teeth crowding.1,2,3,4

The treatment options for Class II/2 are growth modification, dental compensation, or orthodontic treatment combined with orthognathic surgery.5,6 This case report presented the use of improved super-elastic Ti-Ni alloy wire (ISW; developed by Tokyo Medical and Dental University, Japan)7,8 for the treatment of Angle Class II/2 with an unstable mandible position.

The properties and characteristics of ISW are super-elasticity, shape memory, as well as shock and vibration absorption property.7,8 This article describes the experience of treating a case using ISW combined with intermaxillary elastics (IMEs) to correct a deep overbite by proclining the maxillary incisors. This helped the patient to gain an aesthetically pleasing smile with satisfaction.
CASE REPORT

A 28-year-old woman came to our clinic with a chief complaint of poor dental alignment and a gummy smile caused by retroclined maxillary incisors. She denied any major systemic diseases or drug allergies and was considered to be healthy.

CLINICAL FINDINGS

The clinical examination revealed the patient had an Angle Class II/2 malocclusion with a skeletal Class II jaw bone relationship. Her facial profile showed a shortened lower third of the face with a deep mentolabial fold and protrusive lips. The intraoral examination indicated a dental Class II/2 malocclusion with a 2 mm overjet and 100% overbite. The gummy smile was present. The maxillary incisors were retroclined and the mandibular incisors were retropositioned (Figure 1).

The lateral cephalometric analysis revealed a Class II skeletal basal bone relationship (ANB: 10.1°) and a low mandibular plane angle of 31.5°. Many parameters were not within ideal ranges. In particular, the U1 to FH plane angle was only 87.3° (Figure 2).

TREATMENT OBJECTIVES

1. To improve the facial profile.
2. To reduce deep bite and establish proper overjet and arch coordination.
3. To mitigate gummy smile caused by excessive gingiva display.
4. To guide a stable occlusion.

TREATMENT ALTERNATIVES

1. Orthodontic treatment
2. Prosthodontic treatment
3. Orthodontic treatment combined with orthognathic surgery

The ideal treatment for the patient was orthodontic treatment combined with orthognathic surgery. Mandibular surgery could rotate the mandible forward and downward to improve mandible projection and increase the lower facial height. If the skeletal problem were solved, the orthodontic treatment would be easier. The patient declined the proposal of orthodontic treatment combined with surgery (option 3). Prosthetic work would not correct the long tooth axis or mitigate the gummy smile (option 2). Therefore, our patient agreed to undergo orthodontic treatment for dental camouflage (option 1).

TREATMENT PROGRESS

After thorough explanation and discussion of the treatment options, the patient agreed to have orthodontic treatment without surgical approach.

The maxillary alignment was initiated with bonding of 0.018 × 0.025-inch brackets and leveling 0.016 × 0.022-inch ISW for 3 months. By then, the preliminary leveling and alignment in maxillary arch were gradually achieved. After the upper teeth were leveled and crowded, bracket bonding was applied on the mandibular arch. The brackets were placed upside down. The IMEs were applied for midline correction and desirable interdigitation.

RESULTS

After 21 months of therapy, adequate overbite, overjet and coordinated dental midline were achieved. The facial profile of the patient was greatly improved, the mentolabial fold became shallow, and the gummy smile was reduced by proclination of upper central incisor (Figure 3). Overall, the patient was satisfied with her profile improvement and smile arc. The cephalometric analysis indicated almost all parameters had improved, especially a lower pharyngeal width, as measuring from the intersection of the posterior border of the tongue and the inferior border of the mandible to the posterior pharyngeal wall, had increased from 9 mm to 11 mm (Figure 4).
Facial photos

2015-06-01
28 y 0 m

Before active treatment

Intraoral photos

2015-06-01
28 y 0 m

*Figure 1.* Facial and intraoral photos showing typical characteristics of Class II division 2 malocclusion.
**X-ray findings (1)**

![Pretreatment panoramic film and cephalometric radiographs with profilogram and polygon.](image1)

**X-ray findings (2)**

![Pretreatment panoramic film and cephalometric radiographs with profilogram and polygon.](image2)

**Polygon- Before active treatment**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Mean</th>
<th>SD</th>
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<tr>
<td>Facial angle</td>
<td>90.5</td>
<td>94.63</td>
<td>3.05</td>
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<tr>
<td>Convexity</td>
<td>23.3</td>
<td>7.88</td>
<td>4.95</td>
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<td>A-B plane</td>
<td>17.1</td>
<td>-4.11</td>
<td>3.50</td>
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<td>Mandible plane</td>
<td>31.5</td>
<td>26.81</td>
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<tr>
<td>Y-axis</td>
<td>58.7</td>
<td>56.18</td>
<td>5.63</td>
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<tr>
<td>Occlusal plane</td>
<td>10.6</td>
<td>11.42</td>
<td>3.64</td>
</tr>
<tr>
<td>Incisor mesial</td>
<td>139.8</td>
<td>124.09</td>
<td>7.63</td>
</tr>
<tr>
<td>L-1 to Orbital</td>
<td>92.1</td>
<td>52.84</td>
<td>5.28</td>
</tr>
<tr>
<td>L-1 to Mandible</td>
<td>101.4</td>
<td>96.33</td>
<td>5.78</td>
</tr>
<tr>
<td>U-1 to A-P plane</td>
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<td>5.92</td>
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<tr>
<td>FMAD</td>
<td>40.4</td>
<td>54.63</td>
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<td>6.19</td>
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<tr>
<td>SNA</td>
<td>81.6</td>
<td>83.32</td>
<td>3.48</td>
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<tr>
<td>SNB</td>
<td>11.5</td>
<td>78.90</td>
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<td>SNA-SNB difference</td>
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<td>3.39</td>
<td>1.77</td>
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<tr>
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<td>11.74</td>
<td>2.73</td>
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<tr>
<td>U-1 to FH plane</td>
<td>87.3</td>
<td>111.13</td>
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<td>U-1 to SN plane</td>
<td>77.8</td>
<td>104.54</td>
<td>5.55</td>
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<tr>
<td>Gonial angle</td>
<td>121.5</td>
<td>122.23</td>
<td>4.63</td>
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<tr>
<td>Ramus inclination</td>
<td>90.0</td>
<td>87.07</td>
<td>4.40</td>
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</table>

*Figure 2.* Pretreatment panoramic film and cephalometric radiographs with profilogram and polygon.
ISW for Class II division 2 Malocclusion

Facial photos

2017-03-13
30 y 09 m

After active treatment

Intraoral photos

2017-03-13
30 y 09 m

Figure 3. Posttreatment facial and intraoral photos.
Figure 4. Posttreatment panoramic film and cephalometric radiographs with profilogram and polygon.
Superimposition (1)
- Superimposed on SN plane at S -

28y 00m before
30y 09m after

Superimposition (2)
- Superimposed on Palatal plane at ANS -
- Superimposed on Mandibular plane at Me -

28y 00m before
30y 09m after

Figure 5. Superimposition of lateral cephalometric tracings. Black line, before treatment; red line, after treatment.
Figure 6. Correct midline with differential IMEs.

Figure 7. Overjet and overbite corrected with IMEs for a more desirable overbite–overjet relationship.
Discussion (4): Profile change, smile arc and tooth show

Figure 8. Curvature at the lower lip area was smoother, and mentalis strain was relieved through orthodontic functional correction and forward tipping of lower anterior teeth.

Figure 9. A circumferential retainer was delivered at the upper arch. A Hawley retainer was delivered at the lower arch. A functional orthopedic appliance was delivered for stabilizing the interjaw relationship as a retainer (for night use only).
At the end of treatment, we gave the patient a circumferential retainer at the upper arch, a Hawley retainer at the lower arch, and an auxiliary clear plastic retainer for retention. Moreover, a functional orthopedic appliance was delivered to stabilize the interjaw relationship as a retainer (for night wear only). The treatment outcome maintained stable after several appointments of recalls (Figure 9).

DISCUSSION

In this case, the patient experienced retroclined upper central incisors, a deep bite, a midline deviation, and poor dental alignment. Her short teeth and gummy smile were reported to affect her self-confidence.

In the process of orthodontic treatment, we used differential IMEs to guide the mandibular position for midline correction. Initially, the midline was deviated to the right side by approximately 2.5 mm. After leveling, we eliminated the dental interference from the retroclining upper central incisors. Midline correction was achieved within 16 months by using IMEs (Figure 6). It took 16 months to correct the midline using differential IMEs because of her unstable mandibular position. The patient's 100% overbite was corrected through proclination of the upper central incisors and the slightly downward positioning of the mandible (Figure 5). The flaring of the upper central incisors created a 6 mm overjet. We used a Class II IMEs (R: 13–46; L: 23–36), reverse the curve of Spee and flaring the lower anterior teeth to reduce the overjet. The intermaxillary elastics are: 3/16” 3.5 oz (Figure 5 and Figure 7). 9,10,11

The lip posture and tooth show were harmonized by reduce the gummy smile through flaring of the upper central incisors (root torque-in). Curvature in the lower lip area became smoother, and mentalis strain was relieved through orthodontic forward tipping of lower anterior teeth (Figure 5). She was satisfied with her smile arc and facial profile improvement as compared with her pretreatment facial profile.

CONCLUSION

In this case, we corrected poor dental alignment by rapid leveling of using the ISW. ISW can provide an efficient and easy approach to correct this particular malocclusion. After the treatment, a desirable outcome was achieved, and the patient was pleased with the treatment result.

REFERENCES

