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Nonsurgical Treatment of an Adult Patient with Bilateral Scissors-bite and Class II Division 2 Malocclusion

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INTRODUCTION

Scissors-bite is a rare condition but not uncommon to appear with Angle's Class II division 2 malocclusion which characterized with deep overbite and retroclined maxillary incisors. The most frequently involved teeth of scissors-bite are second molars. Maxillary second molars tend to erupt buccally while mandibular second molars tend to tilt linguually during mixed to permanent dentition.

Nonsurgical treatment of scissors-bite usually employs transpalatal arch appliance, interarch elastics, removable bite plate with extending hooks and temporary anchorage devices (TADs). With elastomeric chain or other traction force, TADs can prevent side effects such as extrusion of posterior teeth and clockwise rotation of mandible. It is also easier for patient to adapt with no further cooperation.

This case report presents a young female adult who had Class II division 2 malocclusion with deep overbite and bilateral scissors-bite. The treatment plans included intrusion of incisors, scissors-bite correction with removable bite plate for disocclusion, TADs to assist maxillary molar intrusion, mandibular molar uprighting and vertical dimensional control.

Keywords: Angle's Class II division 2 malocclusion; bilateral scissors-bite; deep overbite; canted anterior occlusal plane; temporary anchorage devices (TADs).
CASE REPORT

Finding and Diagnosis

The female patient, 20 years and 1 month of age, had chief complaints of gummy smile, crooked front teeth and protruded lips. She had no systemic disease nor drug allergy history. Her face is symmetrical and her profile is convex with an acute nasolabial angle and protrusive lips. The lower anterior facial height is proportionally shorter than its upper counterpart (Figure 1A).

Clinical examinations revealed Class II canine and molar relationships on both sides with bilateral scissors-bite upon right second and third molars, plus second premolars and all the molars on the left side. The edges of the over-erupted mandibular incisors occluded with the palatal mucosa of the maxillary incisors. Deep overbite was 10 mm on the right and 8 mm on the left. Overjet was 3 mm on the right and 6 mm on the left due to different inclination of two central incisors. The dental midlines almost coincided with the facial midline. In addition, there was a left side up and right side down canted occlusal plane of anterior teeth (Figure 1A and 2A).

The over-erupted maxillary second and third molars were clearly observed on dental casts (Figure 3A). There was 3.5 mm arch-length discrepancy on the maxillary arch and 5 mm on the mandibular arch. A 3 mm curve of Spee was found in the mandibular dentition.

The impacted mandibular left third molar can be clearly seen on panoramic radiograph (Figure 4A). The posterior-anterior cephalometric radiograph revealed an asymmetric distance from bilateral maxillary jugulare points to the mid-sagittal line (Figure 5A).

Figure 1. Facial photographs: A, pre-treatment; B, post-treatment; C, retention.
The patient was noted with decreased the gingival display, parallel occlusal plane with the interpupil line, improved lip posture and the muscle tone during smile until one year after treatment.
Figure 2. Intraoral photographs: A, pre-treatment; B, in progression; C, post-treatment; D, retention. Stable occlusion and periodontal condition were maintained after treatment. There was no significant increase of overbite during the retention period.
Figure 3. Dental casts: A, pre-treatment; B, post-treatment. The lingual tilting of mandibular left posterior teeth was more severe than the other side. After the treatment, arch form was in symmetric ovoid shape.

Figure 4. Panoramic radiographs: A, pre-treatment; B, post-treatment. The post-treatment root parallelism was acceptable. There were persisted intrusion and retraction forces over maxillary incisors during treatment, moderate root resorption was shown after treatment.
Figure 5. Posteroanterior cephalograms: A, pre-treatment; B, post-treatment.

The interjugulare width was different with left side wider. After treatment, the interjugulare width was the same, but intermolar width decreased.

Figure 6. Lateral cephalograms: A, pre-treatment; B, post-treatment.

After the correction of scissors-bite, the lower anterior facial height increased subtly.
Scissor bite in Class II Division 2 Malocclusion

The cephalometric analysis revealed a skeletal Class II jaw relationship (ANB, 4°) with a low mandibular plane angle (MP-SN, 22°) (Figure A and Table 1). The maxillary right central incisor was retroclined (U1-SN, 78°) and the mandibular central incisor was proclined (L1-MP, 100°), resulting in an increased interincisal angle (U1-L1, 134°). Both lips were in front of E-line.

The patient was diagnosed as Angle Class II division 2 malocclusion with low mandibular plane angle, moderate crowding, canted maxillary anterior occlusal plane, bilateral scissors-bite and lip protrusion.

<table>
<thead>
<tr>
<th>Table 1. Cephalometric analysis</th>
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<tr>
<td>The skeletal measurements were changed due to clockwise rotation of mandible. Interincisal angle was decreased and naso-labial angle was increased. Both lips retracted close to E-line.</td>
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<tr>
<td><strong>SKELETAL ANALYSIS</strong></td>
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<tr>
<td>SNA°</td>
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<tr>
<td>SNB°</td>
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<tr>
<td>ANB°</td>
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<tr>
<td>Wits appraisal(mm)</td>
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<tr>
<td>SN-MP° (Me-Go)</td>
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<tr>
<td><strong>DENTAL ANALYSIS</strong></td>
</tr>
<tr>
<td>U1 to NA (mm)</td>
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<tr>
<td>U1-SN°</td>
</tr>
<tr>
<td>L1 to NB (mm)</td>
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<tr>
<td>L1-MP°</td>
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<tr>
<td>U1-L1°</td>
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<tr>
<td><strong>SOFT TISSUE ANALYSIS</strong></td>
</tr>
<tr>
<td>Naso-labial angle°</td>
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<tr>
<td>E-line(mm)</td>
</tr>
<tr>
<td>Upper</td>
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<tr>
<td>Lower</td>
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</table>

Treatment Objectives and Treatment Plan

In accordance with the patient’s concerns, the treatment objectives were to: (1) correct incisors and lips relationship, (2) eliminate excessive maxillary gingival display, (3) obtain a consonant smile arc and harmonized facial profile and (4) achieve Class I canine and Class II molar relationship occlusion, (5) correct the scissors-bite in the molars.

It was planned to extract maxillary second premolars, maxillary second molars and mandibular third molars. The TADs were applied to correct the scissors-bite in the molar region.
Treatment Progress

Extraction of maxillary second molars and mandibular third molars was performed before treatment. Fixed appliances with 0.022 X 0.028-inches slot were placed. Selective brackets bonding of maxillary incisors and first molars, proper wire sequences with tip back bend were used not only to level the anterior occlusal plane but also reduce the amount of overbite and the maxillary gingival display. After initial leveling and alignment of maxillary anterior teeth, removable maxillary biteplate was prepared to create vertical space for deep overbite and scissors-bite correction. Mandibular dentition was then aligned by round wires and gradually leveled by rectangular wire with buccal crown torque especially on the lingually tilted molars.

Six months later, scissors-bite in the left side still existed. Excessive overjet resulted from correction of inclination of maxillary incisors was then noted. Insertion of three mini screws were done. One was on maxillary right buccal inter-radicular, two were on maxillary left palatal vault and mandibular left buccal shelf. Two maxillary second premolars were extracted for maxillary anterior retraction. With the aid of TADs, intrusion of maxillary molars, uprighting of lingually tilted mandibular molars and reinforcing anchorage to close extraction space could be achieved simultaneously.

After space closure, arch wires were changed from 0.017 X 0.025-inches stainless steel wires to 0.017 X 0.025-inches titanium-molybdenum arch wires (TMA) for detailing. The total treatment period was 2 years and 10 months. A maxillary wrap around retainer with flat anterior guiding plane for preventing vertical collapse and a modified mandibular Hawley retainer with labial acrylic shield for prevent relapse of crowding were used.

Treatment Result

A consonant smile arc and normal maxillary gingival display during smiling was achieved after treatment (Figure 1B). The retraction of upper and lower lips improved the patient's lip posture and facial profile. Ideal overjet (2 mm) and overbite (2 mm), Class I canine and Class II molar relationships were achieved (Figure 2C). Good interdigitation of posterior teeth and changes of intermolar width were obtained after elimination of bilateral scissors-bite (Figure 3B and Table 2). Acceptable root parallelism and moderate root resorption of anterior teeth were observed (Figure 4B).

Superimposition of pretreatment and post-treatment cephalometric tracings demonstrated that both maxillary and mandibular incisors were tipped labially and intruded. An acceptable interincisal angle was also obtained. There was mild intrusion of maxillary first molar, slightly extrusion of mandibular first molar and clockwise rotation of the mandible after correction of scissors-bite (Figure 7). The patient's occlusion and facial esthetics were generally stable after 1 year of retention (Figure 1C and 2D).

DISCUSSION

Deep overbite, canted occlusal plane and display of maxillary gingiva

Class II division 2 malocclusion characterized by marked horizontal growth pattern with counter-clockwise rotation of the mandible, over-erupted and retroclined upper incisors leading to gummy smile and deep overbite. After growth spurt, the vertical problem was mainly dental origin rather than skeletal. In some cases, lower incisors incisal edge occlude on palatal cervices of maxillary incisors, can cause gingival recession, loss of alveolar bone and occurrence of diastema.

The intrusion of maxillary incisors was performed with selective bonding of four maxillary incisors and two first molars where it acts as an anchorage unit. Without bonding of brackets over premolars in the beginning, the long span arch wire with asymmetric tip back bend in front of two first molars delivered light force and adequate moment not only to intrude incisors but also changed the cant of the occlusal plane. During intrusion of incisors, it is important to check probing depth and thickness of gingiva to make sure the periodontal condition is adequately healthy.
Table 2. Measurements of arch width.

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<tr>
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<th>PRE-TREATMENT</th>
<th>POST-TREATMENT</th>
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<tbody>
<tr>
<td>MAXILLARY INTERCANINE WIDTH</td>
<td>32</td>
<td>32.5</td>
</tr>
<tr>
<td>MANDIBULAR INTERCANINE WIDTH</td>
<td>25</td>
<td>26</td>
</tr>
<tr>
<td>MAXILLARY INTERMOLAR WIDTH</td>
<td>51</td>
<td>49</td>
</tr>
<tr>
<td>MANDIBULAR INTERMOLAR WIDTH</td>
<td>36</td>
<td>46.5</td>
</tr>
</tbody>
</table>

INTERCANINE WIDTH: distance between cusp tips of bilateral canines(mm)
INTERMOLAR WIDTH: distance between mesial buccal cusp tips of bilateral first molars(mm)

Figure 7. Superimposed cephalometric tracings of pre-treatment and post-treatment: A, on the sella-nasion plane; B, on the palatal plane; C, on the mandibular plane.

The amount of extrusion in mandibular first molars was more than that of the intrusion in maxillary first molars, so a clockwise rotation of mandible was found. Since the patient had short lower anterior facial height and prominent chin, it was desirable to increase the mandibular plane angle.
Relationship between maxillary incisors and lips

The stability of tooth position is affected by the balance of surrounding soft tissue including lips and tongue.\(^4\) The ideal position of interlabial gap at rest is about 2 mm above maxillary incisal edge.

In Class II division 2 malocclusion, a high lip line presented and often at the level near the cervical region of the maxillary central incisors, instead of 2 mm superiorly to the incisal edge in normal condition. The upper lip plays little or no role in the positioning of the maxillary incisors.\(^5,6\) Instead, it is the lower lip which cover large portion of the labial surface of maxillary incisors can insert a considerable lingual force to the teeth. Thüer et al also pointed out that this is the most important characteristics of Class II division 2 malocclusion.\(^7\) Other types of malocclusion seldom have such similar magnitude of lip pressure. Lapatki et al investigated with electromyograms and concluded that the force of lower lip opposing maxillary incisors at rest is greater in Class II division 2 when compared with Class II division 1 or Class I malocclusions.\(^6\)

During developmental stages, teeth erupted to establish an overbite at anterior region, with the increase in size of the maxillary central incisors’ surface covered by the lower lip, these teeth can continue to tip palatally. The force of lower lip exerts pressure on mandibular incisors and push them further lingually indirectly through the contact with maxillary incisors. The abnormal lip position caused a force extended by the lower lip on the maxillary incisors, therefore, it should be normalized during orthodontic treatment.

After treatment, the torque of maxillary incisors was improved. The patient’s lip line became normal, thus lower lip was no longer against maxillary incisors. In comparison of post-treatment and retention period (Figure 2C and 2D), overjet and overbite still kept within normal range, the stability between lips and incisors was satisfied.

Correction of scissors-bite

There are various methods to correct scissors-bite, one of them is to use a transpalatal arch with soldered hooks for palatal traction of molars. However, the appliance will cause gingival irritation, food debris impaction and discomfort. The other choice is to use the intermaxillary cross-elastics to improve the buccolingual inclination of molars and the overbite. However, such treatment method requires patient’s cooperation and might not be stable enough due to the increase of lower anterior facial height. Last therapeutic method involves orthognathic surgery of posterior region, but this approach was too invasive and was denied by the patient who expected orthodontic treatment along without surgical intervention. Considering those factors, we adopted TADs to intrude the over-erupted maxillary molars and unroll the mandibular molars as a more desirable approach to achieve the treatment objectives.

The patient had bilateral scissors-bite. It is clear that the lack of space in both transverse and vertical dimensions, especially on the left side. The first step of the treatment is to provide sufficient intermaxillary space by using removable bite plate to temporarily open the vertical height. It becomes more convenient to intrude maxillary molars and unroll lingually tilted mandibular molars. Biting brackets dislodgement can also be avoided.

After initial leveling and alignment, scissors-bite over left side still persisted. With adopting the treatment methods from Jung and Tamamura,\(^9,10\) it is found that using TADs to correct scissors-bite is time-saving and patient’s compliance is not in demand. One screw was placed over maxillary right buccal inter-radicular area, the other two were put over maxillary left palatal vault and mandibular left buccal shelf. TADs became stable after a month, elastomeric chains were applied from brackets to screws, to start intruding the over-erupted maxillary molars.
Scheffler et al reported that with the help of TADs, the average intrusion amount of maxillary molars was 2.3 mm and the relapse amount was 0.5 mm at one year. The present case has shown that the posterior occlusion and overjet were stable after one year of retention.

Proclination of mandibular incisors

It is crucial to avoid excessive labial proclination of mandibular incisors, because severe gingival recession, dehiscence of alveolar bone and presence of black triangle may occur to endanger the periodontium and mini-esthetics. Mandibular incisors were intruded and labially proclined by archwire with reverse curve of Spee, thus reducing the overjet and establishing better interincisal relationship which in turn the treatment finishing goal of our case. Fortunately, her antero-posterior width of symphysis was prominent enough to provide sufficient room for root movement. There was no significant periodontal problem during and after treatment (Figure 2B and 2C), root position was still within cancellous bone (Figure 6B). Root resorption can be seen but is within acceptable range (Figure 4B).

CONCLUSION

With the application of light and continuous force to intrude maxillary incisors, the canting of anterior occlusal plane and excessive maxillary gingival display were resolved. The insertion of TADs and delivery of removable bite plate were efficient to correct scissors-bite. After one-year post-treatment follow up, the dental alignment and occlusion remained stable.

REFERENCES