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Non-surgical Treatment for a Patient with Angle Class II Division 2 Malocclusion with Severe Deep Bite: A Case Report

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Non-surgical Treatment for a Patient with Angle Class II Division 2 Malocclusion with Severe Deep Bite: A Case Report

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INTRODUCTION

The orthodontic treatment for Class II division 2 malocclusion (Class II/2) is challenging. Ever since the first description by Dr. E.H. Angle in 1907, the definition of Class II/2 malocclusion has been modified according to various viewpoints. Besides mesially positioned molars and canines, the common characters of the Class II/2 malocclusion include the retroclined maxillary central
incisors, excessive overbite and an obtuse interincisal angle.  

Various treatment suggestions could be proposed to the same patient with Class II/2 malocclusion depending on each orthodontist’s treatment philosophy. However, the relief of the excessive overbite is always important in treating Class II/2 malocclusion. To correct the deep bite, factors to be considered including facial profile, vertical skeletal dimension, and stability of final occlusion. According to different conditions and treatment goals, the deep bite can be corrected by incisor intrusion, molar extrusion, or combination of both.

We presented a non-surgical orthodontic treatment for a patient with trauma history over chin area in his teenage. The absence of incisor support and extremely deep bite induced gingival recession with periodontal abscess surrounding his lower incisors. In addition to the decreased anterior vertical dimension, the patient also suffered from the collapsed posterior occlusion for years.

Considering such a critical situation, surgical-orthodontic therapy was once recommended but was refused by the patient. With understanding the possible compromised result, temporary anchorage devises (TADs) were used to intrude the maxillary incisors to correct the extreme deep bite. The results of this interdisciplinary treatment not only successfully rehabilitated patient’s occlusion but also improved the periodontal status of mandibular incisors remarkably.

### CASE REPORT

A 36-year-old male patient was referred from the periodontal department for evaluation of orthodontic treatment. His chief complaints were painful swelling in the lower anterior gingiva for months and seeking for of full mouth rehabilitation. He denied major systemic disease and drug allergy. His past dental history revealed accidental trauma history over chin area in teenage (Figure 1). After that, the occlusal condition got worse according to patient’s statements. Although the phase I periodontal treatment had been performed to alleviate acute periodontal inflammation, whitish exudate was still noted at the appointment of referral.

![Figure 1. The scar indicated trauma history of the chin region of this patient.](image-url)
Clinical findings

The patient had a Class II division 2 malocclusion on a skeletal class II jaw bone relation. His facial profile exhibited a decreased lower facial vertical dimension. The dental characteristics showed different occlusal plane level between anterior and posterior dentitions, the maxillary dental midline shift toward left side for 1.0 mm, excessive curve of Spee and collapsed posterior occlusion. His deep bite was more than 100%, caused dental abrasion, gingival recession and periodontal abscess over lower incisors (Figure 2).

The lateral cephalometric radiographic examination revealed Class II skeletal base (ANB: 5°), decreased facial mandibular plane angle (FMPA, 14°) that matched the extra-oral impression, and excessive maxillary and mandibular incisor eruption (Figure 3 and Table 1). The panoramic radiograph revealed missing teeth 15, 16, 36, and 46, complicated crown fracture of teeth 23 and 31 which were previously treated with endodontic therapy, bilateral impacted mandibular third molars, and metal crown at right mandibular second molar (Figure 4). The periapical radiographs presented periodontal defects in the mandibular anterior region especially around the right central incisor (Figure 5).

Figure 2. The extraoral and intraoral photographs before treatment.
Table 1. Comparison of cephalometric analytical results before and after orthodontic treatment

<table>
<thead>
<tr>
<th>Norm</th>
<th>Initial</th>
<th>Finished</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNA</td>
<td>88 °</td>
<td>86 °</td>
</tr>
<tr>
<td>SNB</td>
<td>83 °</td>
<td>81 °</td>
</tr>
<tr>
<td>ANB</td>
<td>5 °</td>
<td>5 °</td>
</tr>
<tr>
<td>SN-MP</td>
<td>19 °</td>
<td>20.5 °</td>
</tr>
<tr>
<td>U1– SN</td>
<td>85 °</td>
<td>99 °</td>
</tr>
<tr>
<td>U1-A⊥</td>
<td>-2.5 mm</td>
<td>0 mm</td>
</tr>
<tr>
<td>U1-PP</td>
<td>32 mm</td>
<td>28 mm</td>
</tr>
<tr>
<td>L1– Md</td>
<td>79 °</td>
<td>90 °</td>
</tr>
<tr>
<td>L1– NB</td>
<td>-2.5 mm</td>
<td>0 mm</td>
</tr>
<tr>
<td>L1-Md</td>
<td>43 mm</td>
<td>38 mm</td>
</tr>
<tr>
<td>R. E-line (U)</td>
<td>-1.5 mm</td>
<td>-2 mm</td>
</tr>
<tr>
<td>R. E-line (L)</td>
<td>-1 mm</td>
<td>-3 mm</td>
</tr>
</tbody>
</table>

Figure 3. The lateral cephalometric radiographic film before treatment.
Figure 4. The panoramic film before treatment.

Figure 5. The full mouth periapical films before treatment. Note the periodontal defects in surrounding mandibular anterior region especially around the mandibular right central incisor.
Treatment objectives

The treatment objectives were setup based on patient’s chief complaints and clinical findings, as followings:

1. to relieve occlusal trauma over lower anterior region
2. to create adequate overjet and overbite
3. to achieve solid buccal interdigitation
4. to establish proper occlusal vertical dimension
5. to manage the dental space for prosthesis fabrication

Treatment plan

This non-surgically treatment was applied in conjunction with periodic periodontal control and prosthodontic treatment. The orthodontic treatment plan included:

1. extraction of bilateral mandibular impacted third molars and maxillary left canine.
2. temporary anchorage devices (TADs) to facilitate maxillary incisor intrusion.
3. intentional endodontic treatment of teeth 31 and 41 for further reduction of crown height, better crown-root ratio, and improvement of the overbite.
4. increase of vertical dimension and space management for future prosthetic construction.

Treatment alternatives

The alternative treatment plan was combined with surgical intervention. The overall treatment plan includes:

1. extraction of bilateral mandibular impacted third molars and maxillary left canine.
2. surgical site preparation for maxillary anterior segmental osteotomy (ASO).
3. 2-jaw orthognathic surgery: maxillary ASO impaction and mandibular BSSO advancement.
4. management for vertical dimension and space distribution for prosthetic work.

Treatment progress

After explanation and discussion of possible treatment options, the patient agreed to have non-surgical orthodontic treatment. After the phase I periodontal control, the orthodontic treatment was initiated. Fixed orthodontic appliance was placed only on maxillary dentition at the beginning. Bilateral TADs were placed interdentally since the fifth month for intrusion of maxillary incisors with 0.016 x 0.022 inch stainless steel wire. As the intrusion of maxillary incisors progressed, the overjet increased gradually. At the ninth month, an occlusal bite plate was fitted and cemented on maxillary posterior dentition to further raise the bite and assisted the patient to adapt to the tentative vertical dimension (Table 2).

Table 2. The treatment progress

<table>
<thead>
<tr>
<th>Months of orthodontic treatment</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
<td>Fixed orthodontic appliance was placed only on maxillary dentition</td>
</tr>
<tr>
<td>5-10</td>
<td>Bilateral interdental miniscrews</td>
</tr>
<tr>
<td>9</td>
<td>Occlusal bite plate was fitted and cemented on maxillary posterior dentition.</td>
</tr>
<tr>
<td>10</td>
<td>Fixed orthodontic appliances over mandibular dentition were placed</td>
</tr>
<tr>
<td>17-28</td>
<td>Temporary bridge fabrication: 14x17, 35x37, 45x47</td>
</tr>
<tr>
<td>35-42</td>
<td>Final prostheses delivery: 14x17, 22x24, 35x37, 45x47</td>
</tr>
<tr>
<td>43</td>
<td>Orthodontic treatment finished</td>
</tr>
</tbody>
</table>
Because of the gradual adaptation to the planned vertical dimension without discomforts, fixed orthodontic appliances over mandibular dentition were then placed at the tenth month (Figure 6). Further orthodontic adjustment on maxillary dentition was finished on 0.018 × 0.025” inch stainless steel wire. The lever arms were placed to maintain the intruded maxillary incisors bilaterally.

In the mandibular arch, preliminary leveling and alignment was gradually achieved by sequential change in the wire sequence. The intentional endodontic treatments of mandibular incisors were performed and then followed by incisal reduction for further correcting the deep bite. Once the mesial-tilted mandibular second molars being uprighted, the provisional prostheses were placed for assisting patient to adapt to the rehabilitated vertical dimension. Bilateral Class II elastics were used for finishing and detailing.

After passive maintenance for three months without complaints of discomfort, patient received final prostheses after worth. With patient’s confirmations of acceptable occlusion for proper daily functions, all the fixed appliances were removed. The total treatment duration was 43 months. The patient was satisfied with the treatment outcomes.

Results

After treatment, the gingival status of mandibular incisors improved remarkably, with preservation of bone levels and no signs of gingival inflammation or excessive tooth mobility (Figure 7 and Table 1). Whereas the gingival heights could not return to the normal condition (Figure 8 and Table 1). Also, adequate overbite and functional prosthetic rehabilitation were achieved (Figure 9). We had ever suggested further incisor retraction by bilateral TADs over infrazygomatic crests (IZCs), but the patient declined. Although bilateral Class I canine relationship could not be achieved, the patient was satisfied with the treatment results and the periodontal improvement (Figure 10).

*Figure 6. The occlusal bite plate was fitted after the initial relief of deep bite (9th month).*
Figure 7. Overall and regional superimposition of cephalometric tracing. Black line, initial; red line: finish.

Figure 8. The gingival condition in before and after orthodontic treatment.
Figure 9. The overbite and overjet in before and after treatment.

Figure 10. The extraoral and intraoral photographs after treatment.
The apical resorption of maxillary incisors was observed after intrusive movement. There was a maximum 3 mm external apical root resorption among maxillary incisors, especially the right maxillary central incisor. However, there was no symptom and sign of any discomfort complained by patient regarding this tooth. The clinical condition and reasons of the root resorption were explained to patient and he fully understood (Figure 11).

At the end of treatment, the patient received Hawley retainers for retention. Additional resin pad was designed on the labial bow of mandibular retainer to facilitate bite control. The prosthetic treatment of left mandibular central incisor was advised but patient decided to delay because of economic consideration. The treatment outcome was stable during recall examination.

**DISCUSSION**

In this report, we presented a case with Class II/2 malocclusion with excessive deep bite resulting periodontal damage surrounding mandibular incisors.

The treatment of Class II/2 malocclusion was challenging because of missing of the antagonists of bilateral molars and left side canine. Besides the mesially drifted left maxillary molar and right side Class II canine relation, there were still other additional dental problems including the retroclination of maxillary central incisors, obtuse interincisal angle and the excessive overbite.

It has been a long lasting discussion of the underlying factors contributing to such a unique malocclusion. According to literatures, the Class II/2 malocclusion has several skeletal characters including shorter mandibular length, prominent chin, increased posterior facial height, hypodivergent facial pattern, and acute gonial angle which all matched our case. On the other hand, the most impressive dentoalveolar characters of this patient would be the traumatic deep bite that could be accounted for the retroclination and supra-eruption of maxillary incisors (Table 1). With regard to the mandibular incisors, the cephalometric analysis revealed normal vertical position of lower incisor relative to mandibular plane which was in agreement with other studies. According to these
data, the intrusion of maxillary incisors was the primary solution to reduce the deep overbite.

The non-surgical strategies for orthodontists to correct the deep bite include incisor intrusion, extrusion of posterior teeth and combination approach.\textsuperscript{10-12} Owing to the distortion of posterior occlusion, the bite correction was initiated by TAD-facilitated intrusion of maxillary incisors. The TAD-facilitated incisor intrusion was reported to create a more intrusive movement but less labial crown torque of incisors as compared to the traditional mechanism.\textsuperscript{13,14} It could also be applied in mandible but not in our case because of the limited labial plate and questionable periodontal condition of this patient.

The patient had periodontal disease with the attachment loss over mandibular anterior teeth and periodontal abscess in the mandibular anterior region, resulted from occlusal biting trauma from maxillary incisors. In this situation, periodontal preparation was important and should be performed before orthodontic treatment following by intrusion of maxillary incisors to eliminate trauma from occlusion.\textsuperscript{13} Another reason to have periodontal control before the orthodontic treatment was based on the possible irreversible breakdown of the periodontium when there was still inflammation during orthodontic treatment.\textsuperscript{16,17} It is recommended to observe 2 to 6 months after completion of active periodontal therapy before bracket placement for periodontal tissue remodeling and evaluation of patient’s compliance.\textsuperscript{17} There was a 10-month observation before the placement of mandibular orthodontic appliances to allow the recovery from the occlusal trauma in this case. During this period, gradual improvements of the periodontal health surrounding the mandibular incisors were noted (Figure 8).

In periodontal compromised teeth, the loss of alveolar bone results in apical movement of the center of resistance of the involved teeth which could be prone to tipping movement.\textsuperscript{18} In this case, because of the thin labial plate, the reduction of incisor crown height was performed after the intentional endodontics. Such a procedure would not only have less tipping of the lower incisors, but also be helpful in overbite reduction.

An occlusal bite plate was essential for bite opening. The bite plate was placed to test the patient’s adaption to the change of vertical dimension for future restoration. It was not only beneficial in anchorage reinforcement during retraction of maxillary incisors but also for incisor support (contact) (Figure 6).

The incisor support (contact) was considered important to maintain the overbite correction. It has been reported the more-than 135 degrees of interincisal angle would be more promising in retention.\textsuperscript{19} It was a pity that we were not able to achieve such optimal condition after treatment because of the insufficient mandibular labial plate and maxillary distalization. Patient declined another TADs for the Class II correction. Trying to compensate this drawback, we placed additional resin pad over the labial bow on the mandibular retainer.\textsuperscript{20}

The root resorption was not uncommon in cases with maxillary incisor intrusion.\textsuperscript{21} The maxillary incisors were reported to be the most vulnerable teeth to have root resorption.\textsuperscript{22} The average amount of maxillary incisor resorption was reported as 2 mm in routine orthodontic treatment.\textsuperscript{23} It was suggested that orthodontists should avoid excessive intrusion and palatal root torquing to reduce the amount of root resorption.\textsuperscript{24} However, large amount of incisal intrusion is required in this case. The maximum amount of root resorption of maxillary incisors was less than 3 mm, and there was no any discomfort or complaints during treatment and regular recall.

\section*{CONCLUSION}

To correct the malocclusion with excessive overbite, it was important to analyze the etiology, choose the feasible treatment modalities and communicate with the patient for proper interdisciplinary intervention. The favorable treatment outcome was based on not only the
practitioner’s skills but also patient’s compliance, patience and fully understanding of treatment objective and limitation.

REFERENCES