Class II Deep bite Malocclusion Corrected by Two-stage Approach

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Class II Deep bite Malocclusion Corrected by Two-stage Approach

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INTRODUCTION

Class II malocclusions can be treated with many appliances and treatment protocols according to the characteristics of the problems, such as antero-posterior discrepancy, age, and patient compliance. The timing of treatment for Class II malocclusion remains controversial. To treat some types of skeletal imbalance of most patients with Class II malocclusion, the treatment is aimed at modifying the growth of the jaws. This stage of treatment is usually followed by a presumably simpler, later stage of orthodontic tooth movement. Patients with Class II malocclusion would benefit from two-stage treatment if the skeletal growth could be modified at the first stage of treatment and if this made a difference in terms of the subsequent treatment duration or treatment complexity.

This is a case using headgear, and then followed by full mouth fixed orthodontic treatment. The patient was a 12-year-old boy who needed for correction of Class II malocclusion. The purpose of this report is to share 2-stage treatment outcome for a growing patient with Class II deep bite malocclusion.
CASE REPORT

A 12-year-old male patient did not have known past medical history and systemic disease. Patient and his parents, who complained about dental crowding and unesthetic smile, came to our hospital seeking for treatment to improve his facial profile. His parents mentioned about his nail-biting habit.

The extraoral examination showed facial asymmetry with chin deviated to his right side. No obvious gingival display was found when smiling. He has convex facial profile (Figure 1). Patient’s facial midline and upper dental midline were coincident.

The intraoral examination demonstrated that the overbite was 6 mm and the overjet was 6 mm. There were all permanent teeth, and all the second molars were partially erupted. Both canines and molars were in Class II relationship, and the mandibular dental midline was deviated 1.5 mm to his left side. Upper and lower dental arches were square in shape. In terms of the space analysis, space deficiency was 3 mm in the upper and 4 mm in the lower arch. As for the Bolton’s analysis: the anterior Bolton ratio was 74.3% with upper dentition excess 1.9 mm. The overall ratio was 89.2% with lower dentition excess 2.7 mm (Figure 2 and 3).

Figure 1. The patient had his orthodontic records at the age of 12 years old. Protrusive upper and lower lip, and no gummy smile were revealed. He had convex profile and slightly facial asymmetry.

Figure 2. Intraoral photographs before orthodontic treatment showed overbite was 6 mm and the overjet was 6 mm. Square-shaped dental arches were noted.

Figure 3. The bilateral Class II canine and molar relationship can be clearly seen in study models.
From patient’s initial panoramic radiograph (Figure 4), we could observe the presence of all third molar tooth germs, and bilateral condyle head were intact and almost symmetric. From the pre-treatment hand plate film (Figure 4), we could estimate the patient’s skeletal maturity was at the NTUH-SMI stage 3 (S), suggested that this patient was approximately 1 year before maximum pubertal growth. Initial lateral cephalometric analysis indicated a skeletal Class II facial pattern with low mandibular plane angle, and upper and lower incisors were retroclined (Figure 5).

**Diagnosis**

The above data indicated that this patient had skeletal Class II relationship with low mandibular plane angle, and with problem of maxilla excessive growth. In the dental aspect, he had Class II malocclusion with deep overbite and large overjet. In the soft tissue aspect, he had convex profile with protrusive upper and lower lips.

**Treatment objectives and treatment planning**

The treatment objectives included: (1) improve facial esthetics; (2) establish optimal overjet, overbite...
and stable occlusion; (3) achieve bilateral Class I molar relationships.

According to our analysis, we proposed the 2-stage treatment plan to resolve the chief compliant of the patient and his parents:

Stage I was the headgear usage for inhibition of maxilla growth and for molar distalization.

After re-evaluation, we decided to start the stage II treatment: full mouth orthodontic fixed appliance therapy with non-extraction approach.

In addition, headgear and Class II elastics were used for anchorage control.

**Treatment progress**

1. After explanation and discussion of the treatment plan with the patient and his family, the stage I treatment was in progress. We banded the bilateral maxillary first molars, and asked patient to wear the low pull headgear for at least 15 hours per day. The force, which was applied, was approximately 350 grams per side.

2. After 11 months, we took record for re-evaluation.

3. From extra-oral examination, the patient still showed convex profile at the lateral view. From intra-oral examination, there were several spaces over upper arch. Bilateral molars showed Class III relationships and canines showed Class II relationships. The overbite was 6 mm and the overjet was 4 mm (Figure 6). In the mid-treatment lateral cephalometric analysis, the patient still maintained a skeletal Class II facial pattern with low mandibular plane angle. Upper and lower incisors were retroclined (Figure 7).

4. After re-evaluation, we decided to start the stage II treatment: full mouth orthodontic fixed appliance therapy with non-extraction approach. In addition, we asked patient to wear headgear and Class II elastics for anchorage control.

5. Full mouth banding and bonding of pre-adjusted 0.018-inch brackets excluding the upper and lower second molars.

6. The initial leveling and alignment was carried out

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**Figure 6.** After 11 months stage I treatment, we took record for re-evaluation. The patient still showed convex profile at the lateral view extra-orally, and bilateral molars showed class III relationships intraorally.
by Ni-Ti wire.

7. After 2-month of leveling, the main working wires of 0.016x0.022-inch TMA were placed, with reverse curve of Spee in the lower archwire.

8. Subsequently, we used 0.016x0.022-inch stainless steel wires as main wires. We used power chain to close the spaces over upper arch, and used intrusive arch in lower arch to reduce the overbite. Then, we asked patient to wear the Class II elastic at the same time.

9. We bonded the upper and lower second molars after they fully erupted and we sequentially changed the archwire from Ni-Ti, 0.016x0.022-inch TMA to 0.016x0.022-inch stainless steel wires. We still kept the lower intrusive arch.

10. We consolidated the occlusion and coordinated the upper and lower arch, and the Class I canine and molar relationships with optimal overjet and overbite were obtained.

11. Patient was encouraged to continue wearing headgear at night for anchorage control during the whole stage II treatment.

12. After debond, upper Hawley retainer with a resin bite plate from canine to canine on the palatal surface and lower conventional retainer were delivered. The treatment results were regularly followed up at our clinic.

Treatment results

The results indicated that the facial profile was harmonious. The normal overbite and overjet were obtained, and a bilateral Class I molar relationships with solid interdigititation were achieved (Figure 8). The posttreatment panoramic radiograph demonstrated acceptable root parallelism without obvious root resorption. (Figure 9). Cephalometric analysis after debonding revealed treatment result with growth change (Figure 10). Patient showed a skeletal Class I, low mandibular plane angle. The upright upper incisors and the lower incisors were within normal range.

Superimposition of the pretreatment and post-stage I treatment tracings showed that maxilla and mandible downward moved (Figure 11). Chin projection and upper and lower lip projection increased. The growth of the maxilla was controlled by headgear, and treatment changes of dental effect showed the maxillary molars were distalized.

After two stage treatments, cephalometric superimposition of the pretreatment and debonding

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Figure 7. Mid-treatment lateral cephalometric film with measurement data.
Figure 8. After stage II treatment, we took debonding record. The patient showed harmony profile extra-orally, and bilateral molars showed class I relationships intraorally.

Figure 9. Panoramic film after orthodontic treatment.

Figure 10. Lateral cephalometric film with measurement data after debonding.
records showed that maxilla downward moved, mandible downward and forward moved, chin projection increased (Figure 12). The facial profile was improved. From the regional superimposition on maxilla, we could observe that upper incisors were retracted and extruded, upper molars were extruded and distalized. From the regional superimposition on mandible, we could see that lower incisors were extruded, and lower molars were extruded more and distalized. The growth of condyle was also observed.

The outcome of patient’s growth with the 2-stage therapy was pleased. Solid occlusion was also maintained in three years follow up records (Figure 13). The profile change was inspiring (Figure 14).

![Figure 11](image1.png)

*Figure 11. Cephalometric tracings of pre-treatment and post-stage I treatment head films were superimposed.*

![Figure 12](image2.png)

*Figure 12. Cephalometric tracings of pre-treatment and post-stage II treatment head films were superimposed.*
Figure 13. 3 years following up after debonding, we took record. The patient still maintained harmony profile extra-orally, and kept solid occlusion intraorally.

Figure 14. Patient’s profile change in serial photographs.
DISCUSSION

The timing of treatment should be the important concern about achieving successful treatment of any skeletal discrepancy. Early orthodontic treatment might have some advantages, such as the possibility of growth modification, and the improved patient’s self-esteem and so on. In contrast, we should also pay attention to the disadvantages for beginning treatment too early: increasing cost, loss of patience of patient and their parents, and possibly iatrogenic problems.

This patient visited our clinic at 12 years old. We could estimate the patient’s skeletal maturity was at the NTUH-SMI stage 3 from the pre-treatment hand plate film, and it suggested that this patient was approximately 1 year before maximum pubertal growth. We took advantages of patient’s growing potential and his good compliance, and favorable result was achieved after the headgear usage. After re-evaluation, we found that the bilateral molar relationships were changed from Class II to Class III, and there was generalized spacing over the maxillary arch. The mid-treatment result was helpful in arch alignment and correction of the original Class II malocclusion. Despite the unpredictability of growth, its presence or absence profoundly influences the results. Coordination of treatment with the pubertal growth spurt means a greater likelihood of success.

Moreover, why we chose low pull headgear for the patient’s stage I treatment? There are many treatment modalities for Class II malocclusion patients, according to different treatment protocols and problems, such as antero-posterior discrepancy, age and patient compliance. If the malocclusion involved the skeletal problems, the treatment options may include growth modification, dental camouflage and orthognathic surgery. The growth modification in skeletal Class II malocclusion can be assisted by headgear and other functional appliances. From the skeletal aspect, headgear is used to restrict the normal downward and forward maxillary growth, and let the mandible continue to grow and to "catch up" with the maxilla. From the dento-alveolar aspect, headgear tends to distalize the maxillary molars. From the soft tissue aspect, the usage of headgear was tried to correct the facial convexity.

To select a headgear type, Alexander offered one of the methods, which depended on the vertical skeletal pattern. Whether the facial pattern of the patient is hypo-divergent or hyper-divergent will influence treatment decisions. He suggested that if the SN-MP (sella-nasion-mandibular plane) angle is 35 degrees or less, Class II skeletal patterns can best be treated with a cervical facebow. In the growing patients with Class II malocclusion and vertical deficiency, they tend to have a low mandibular plane angle (skeletal deep bite). Profit suggested that one way to correct such problems is using cervical headgear, taking advantage of the extrusive tendency of extraoral force directed below the center of resistance of the teeth and the maxilla.

In our case, the boy patient who showed Class II malocclusion with low mandibular plane angle still had growing potential. His SN-MP (sella-nasion-mandibular plane) angle was 28 degrees. According to Profit and Alexander’s recommendations, we chose low pull headgear (as known as cervical facebow, cervical headgear) for our stage one treatment modality. We utilized the extra-oral appliance to restrict the forward movement of maxilla, and to achieve extrusion and distalization of the maxillary first molars.

Someone may doubt the treatment efficiency of low pull headgear due to the necessity of the patient’s compliance. With the advancement of techniques and materials, temporary anchorage devices (TADs) may have some similar effects as headgear, and TADs need less patient’s cooperation. However, Profit suggested that TADs are not indicated prior to about 12 years of age due to low bone density. In this case, the 12-year-old boy and his parents preferred to treat with
less invasive method, and the patient showed good compliance during treatment with regular appointment.

CONCLUSION

For growing patients who have Class II deep-bite malocclusion with low mandibular plane angle, we can combine orthopedic and orthodontic treatment to achieve the treatment goal. In this case report, we use low pull headgear for stage I treatment to restrict the growth of maxilla and distalize the upper first molars. For stage II, we started full mouth fixed orthodontic treatment, and we placed reverse curve of Spee in the archwire and intrusive arch in order to solve the deep overbite. The treatment progress may offer ideas to figure out the problems of patients in similar condition.

REFERENCE