Case report

A case report of an adult patient with Angle Class II Subdivision malocclusion

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Abstract : The case for this paper was an female patient with the midline discrepancy due to asymmetric malpositions of mandibular molars in the anteroposterior plane of space.

After considering the treatment priority and solutions for each problem with risks and benefits on the basis of problem list, it was decided that two first premolars in the maxillary arch and the right second premolar and the left first premolar in the mandibular arch would best be extracted in order to achieve the treatment goals.

It took thirty five months to finish the case and most of the time was spent for improving a Class II relation to a Class I as a part of the active treatment using a combination of power chain and bilateral Class II or asymmetric elastics.

Clinical examination and evaluation of the patient's records for the post treatment and the 2 years following completion of active treatment revealed continued good occlusion and function.

Key words : case report, asymmetrical extraction, Angle Class II, Problem Oriented System
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Introduction

One of the major concerns of patients who wish to receive orthodontic treatment is esthetic affection due to abnormal occlusion[1]. Among esthetic facial problems, what patients most concern is placed on the facial symmetry rather than on the profile in terms of conventional knowledge in the society. The two midlines of maxilla and mandible should be coincided with the facial midline, which is cited in particular as an important factor[2]. When the midline discrepancy is revealed, it should be carefully evaluated which midline is deviated. If the discrepancy is caused by the skeletal deformation, it might be corrected by either moving teeth as camouflage by way of compensation for the skeletal discrepancy, or moving jaw(s) by orthognathic surgery[3]. On the other hand, if the midline discrepancy had existed by malpositions of the teeth, only teeth alignments can lead to its correction.

The case we report is an adult female patient with the midline discrepancy due to asymmetric malpositions of mandibular molars in the anteroposterior plane of space. Since the midline discrepancy is caused by various factors, such as the tooth morphology and tooth number, tooth size ratio or improper transition from deciduous teeth to permanent teeth, it is essential to carefully make a problem list regarding how to diagnose based on the Problem-oriented System[4]. Having this list, you may solve the problems logically and make a proper decision[2] for both the patient and the orthodontist.

The diagnosis, the treatment plan, the treatment procedures, and the treatment results including in the retention phase are discussed for this case.

General clinical picture and diagnostic summary

The patient, first examined at the age of , female, had an Angle Class II Subdivision malocclusion. Her chief complaint was anterior crowding in both the maxilla and mandible.

The diagnostic summaries from the problem list using the Problem-oriented System approach are the following:

1. Facial features

The frontal view of the face was well-balanced. The lateral view, or the profile was considered as a straight type.

2. Perimeter

Panoramic film revealed none of the missing or impacted teeth except the third molars. The archlength discrepancy in the maxilla and the mandible was −8 mm, −7 mm, respectively. The maxillary anterior teeth were shoveled in shape. The tooth size ratios were relatively good in both the anterior and posterior regions. In addition, the roots of the right and left maxillary first premolars were slightly curved.

3. Anteroposterior plane

The overjet was +10 mm. As for the canine and molar relationships, both of them were Angle Class II on the right side and Angle Class I on the left. The result of asymmetric molar relationships was that the left mandibular first molar was 3.5 mm more anterior than the right mandibular first molar. The maxillary incisors were proclined labially (U1 to AP : 11.6 mm, and U1 to SN: 116.6°), while the mandibular incisors

A

B

C

Fig. 1 Facial photographs (front view and lateral view)
A: pre-treatment, B: post-treatment, C: post-retention

were slightly inclined (L1 to AP: 2.4mm, and IMPA: 99.8°). No skeletal discrepancy was confirmed by the cephalometric analysis (ANB: 0.7°).

4. Vertical plane

The overbite was 2.0mm. Curve of Spee in the mandible was flat. Cepahlometric analysis confirmed that there are no problems regarding the mandible in the vertical plane (FMA: 25.3°, Y-axis: 62.8°, and Gonial angle: 117.5°).

5. Transverse plane

Mandibular midline was on the facial midline, but maxillary midline deviated 1.0mm to the right. In accordance with the frontal cephalometric analysis, no skeletal deformity was revealed.

6. Interactions

No obvious difference was observed between centric relation and centric occlusion. Review of her medical history was non-contributory to orthodontic treatment. The patient was cooperative.

Treatment goals and treatment plan

1. Treatment goals

Considering the treatment priority on the basis of problem list, the following treatment goals were established:

1) Alleviate maxillar and mandibular arch length deficiencies
2) Correct the Angle Class II relationship to Class I
3) Establish proper overjet and overbite
4) Correct midline discrepancy
5) Establish a good functional occlusion
6) Stabilize of results

2. Treatment plan

This case was diagnosed as an Angle Class II Subdivision malocclusion with crowding.

After considering the treatment priority and solutions for each problem with risks and benefits, it was decided that in the maxillary arch, two first premolars and in the mandibular arch, the right second premolar and the left first premolar would be the best to extract in order to achieve the treatment goals. Fully banded and bonded appliances (022×028 slot straight wire) in both the maxillary and mandibular arches would be anticipated. Upon completion of active phase of treatment, maxillary removable and mandibular fixed, canine to canine retainers would be delivered.

Treatment progress and results

1. Progress of treatment

Fixed appliances (022×028 Straight wire) were placed when the patient was 20 years and 4 months old. Round wires were placed initially to adjust the level and the patient was progressed to rectangular archwires for closing spaces with sliding mechanism. To improve the asymmetric molar relationships and correct the midline discrepancy, unilateral Class II elastics on the right side were used for two months, followed by a combination of power chain and bilateral Class II elastics or asymmetric elastics up to being closed the extraction spaces. The patient had seen on approximately a monthly basis. Thirty-five months were required to finish active treatment. Appliances were removed being followed by retention phase. Maxillary removable and mandibular fixed retainers were delivered. Clinical examination and evaluation of the patient's records for the post-treatment and the 2 years following completion of active treatment were taken.

A

B

C

Fig. 2 Dental casts (front view and lateral view)
A: pre-treatment, B: post-treatment, C: post-retention

A B C

Fig. 3 Dental casts (occlusal view)
A: pre-treatment, B: post-treatment, C: post-retention

2. *Treatment results*

Post-treatment casts present a normal occlusion with proper overjet and overbite except the mandibular midline deviation left. Although the maxillary midline was coincident with the facial midline, the mandibular midline was deviated 1.0 mm to the right. The left mandibular first molar was slightly more anterior to the right first molar. Class I molar relationships were corrected through the treatment both on the right and left sides. After retention, the deviation of the mandibular midline was less, resulting in the shift of 0.5 mm.

Post-treatment panoramic X-ray film presents no pathology or abnormalities. The root parallelism is satisfactory except for the maxillary lateral incisors and canines which are inclined mesially and distally, respectively. Even after retention, the incorrect root paral-

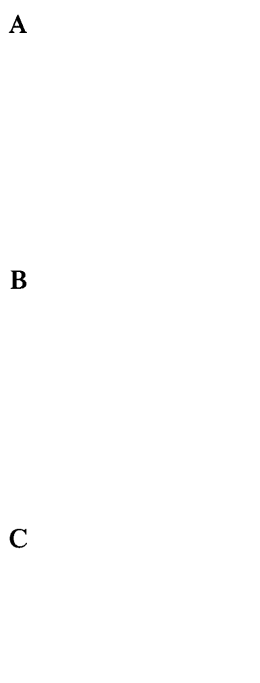

Fig. 4 Panoramic X-ray films
A: pre-treatment, B: post-treatment, C: post-retention

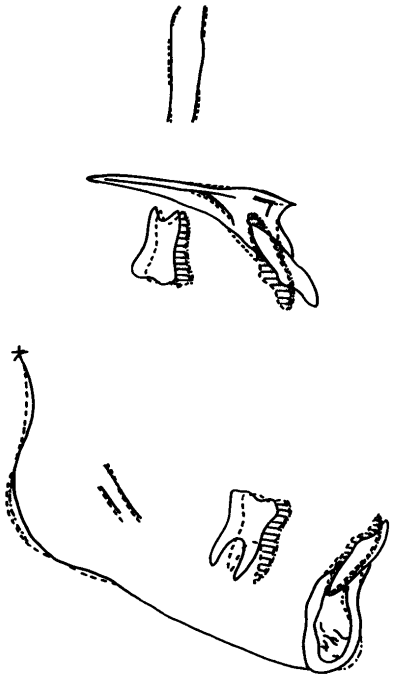

Fig. 6 a:Superimposition on keyridge and structural method for maxillary changes (on the right side)
b:Superimposition on the inner contour of the cortical plate at the lower border of the symphysis for mandibular changes (on the right side)

Fig. 5 Superimposition on structural method for overall changes (on the right side)

lelism was remained. Composite tracing indicates that post-treatment cephalometric film shows little measurable skeletal changes in both the maxilla and mandible (Figs. 5, 6). The maxillary and mandibular dentures are relatively well related to one another and to their respective alveolar process. Maxillary and mandibular incisors were well positioned to meet the values of normal range. Retention phase was discontinued in two years following completion of active treatment. Evaluation of the patient's records for the post-treatment and post-retention revealed continued good tooth alignment and function. The orthodontic treatment results have been very stable during and after the retention phase. The patient was well satisfied with the improvements in facial and dental components, as well as the improvements in oral health and function.

Discussion

1. The treatment strategy

Asymmetrical occlusal relationships in anteroposterior plane of space, and the midline discrepancy are considered to be corrected as top priorities. In previous reports, the use of asymmetric mechanism, such as cross

Table 1 Measurements of cephalometric analysis

Measurement	Mean	S.D.	pre-treatment	post-treatment	post-retention
SNA	81.5°	3.3°	75.5°	76.5°	76.5°
SNB	79.1°	3.6°	74.8°	75.0°	75.0°
ANB	2.5°	2.1°	0.7°	1.5°	1.5°
IMPA	92.1°	5.6°	99.8°	97.3°	95.5°
U1-SN	104.6°	7.1°	116.6°	102.5°	102.8°
FMA	27.8°	4.3°	25.3°	25.7°	26.5°
Occ. plane	9.5°	3.2°	12.1°	12.7°	12.9°

elastics in the anterior teeth and/or unilateral Class II and III elastics on the maxillary and mandibular dentitions, have been recommended[3,5] for an asymmetric case.

If no deviation was found in the skeletal pattern, the force of elastics sometimes brings adverse effects to dentitions, resulting in changes of the occlusal plane angle and/or the mandible plane angle. However, the altered mandibular position has a tendency to return to its physiological position soon after the discontinuation of elastics. This may give occlusion unstable[2].

We proposed the four treatment alternatives. Symmetric extraction seen in the second or the third option was not selected due to the asymmetrical positions of mandibular first molars in the anteroposterior plane of space. The more asymmetrical the malpositioned molars are, the more dependent on the use of the asymmetric elastics the treatment is. The asymmetric mechanism may result in being a higher possibility of unstable factors to retain the occlusion gained by orthodontic treatment.

The fourth option is to extract three premolars; the maxillary first premolars on right and left and the mandibular first premolar on left, ending up a Class II on the right and a Class I on the left side. Rebellato[2] suggests in his paper showing similar cases that end with a Class II molar relationship is effective for asymmetric cases. However, if this option would be considered in this case with the severe crowding, the mandibular midline would be more likely shifted to the left. Thus, in order to establish a Class I on both right and left sides, the first option should be conosiderated. By extracting the mandibular second premolar on the right by asymmetric extraction, we could eventually bring the molar more mesially to correct a Class II to a Class I.

The combination of power chain and bilateral Class II elastics had been used soon after the leveling stage. It is generally believed that the Class II elastics should be used on both sides rather than on one side[3]. Since the right first molar is located 3.5 mm more mesial to the left one, the distance between the hooks becomes longer on the right side, resulting in stronger force at the right, even with the use of same-size elastic on both sides.

2. *Results of the treatment*

The treatment results have almost met the treatment goals previously enumerated. However, in terms of establishing a Class I relationship on the right side, less improvement was confirmed from the evaluation of the model analysis. The mandibular midline was revealed to have deviated about 1 mm after the active treatment, and still about 0.5 mm off after retention phase. As long as the maxillary midline is coincided with the facial midline, the mandibular midline deviation may not cause esthetic problems[3]. On the other hand, a little midline deviation in the mandible could be harmful to neuromuscular function as one of the etiological factors.

The unfavorable root parallelism between the maxillary lateral incisor and canine was confirmed by panoramic X-ray film. The root proximity is significantly dependent on the improper bracket positioning due to unusual tooth morphology[6]. Tooth morphology[6] sometimes make a bracket difficult to be put in right position. Re-evaluation for bracket positioning should have been considered more necessary during the treatment and much attention had to be paid on the bracket positioning.

The change in the findings in the lateral cephalometric analysis was generally based on the previous anticipated treatment plan, and little change could be found after retention. In addition, no change in the mandibular plane angle was seen from the evaluation of the post-retention records. It is essential to be considerate on that there would be always a possibility for mandible to get deviated due to functional shift caused by asymmetric mechanism. But, no deviation between centric relation and centric occlusion was observed in this case.

It took almost three years to finish the case, spending most of time to improve a Class II relation to a Class I as a part of the active treatment.

Clinical examination and evaluation of the patient's records for the post-treatment and the 2 years following completion of active treatment revealed continued good occlusion and function. The orthodontic treatment result has been very stable during and after the retention phase except recurrence of crowding in the mandible, which is now regarded an inevitable biological process[7]. It would be necessary to make a long-term retention to keep teeth straight forever, considering relapse factors including a stomatognathic function.

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