

A Treatment Approach for Lip Protrusion Using KILBON Appliance

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As orthodontic treatment, resolving the patient's chief complaint is a very big part of the purpose of the treatment. The patient want to resolve chief complaint fast and effectively whether it's a functional part or aesthetic part. Orthodontist consider this part of the treatment and should plan even. Many patients in orthodontic treatment is to treat the protrusion. They also wants an aesthetic way. Lingual treatment is suitable for this treatment method and is fulfilling its purpose mainly through tooth extraction. Mechanic ever so many ways to do this are being introduced and actually applied. In recent years, it became possible to achieve a rapid effect in the early treatment period. Furthermore, by combining the digital technology, it is possible to establish the diagnosis, treatment plan and design the device. Two case examples are the introduction of the aforementioned treatments. A case in two, KILBON (Kinematics Of Lingual Bar On Non-parallel force system) system was used to design a system and devices by combining digital technology. we solved the protrusion early. In addition to, we evaluate those benefits and the healing process, and the results to review.

Key words: KILBON, Bialveolar protrusion

INTRODUCTION

In treatment of a patient with lip protrusion, the patient's aesthetical desire is an important factor for both the patient and the orthodontist. In order to address the issue, when tooth extraction is performed and retraction of the anterior teeth is done with a lingual ap-

pliance, torque loss is a difficult problem to deal with in orthodontic treatment. To control it, appliances with a variety of designs and mechanics have been invented. In this study, we present cases in which lip protrusion was resolved in an early stage in treatment with the use of the KILBON (Kinematics Of Lingual Bar On Non-parallel force system) system and torque was

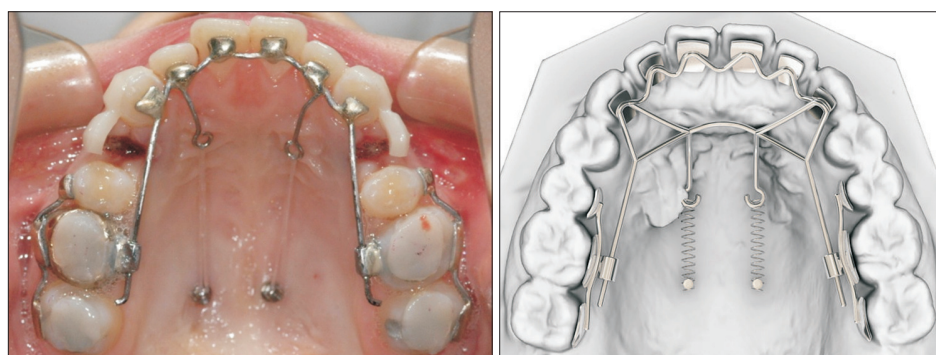


Fig. 1. (A) KILBON appliance. (B) KILBON appliance designed by CAD/CAM. Anterior splint: with 0.9 mm wire soldered to meshes. Posterior splint. Molar tube: guiding the direction of movement. Hook, Guide bar. Palatal TSADs: anchoring retraction movement.

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effectively controlled.

The structure of the KILBON system is based on an existing lingual retractor, with splinting of the posterior teeth, path hole, and guide bar added (Fig. 1).

This system allows intrusion of 6 anterior teeth simultaneously with intrusion of the posterior teeth, and also allows vertical control correspondingly. Also, it has the advantage of making torque control easy while warding off a severe tilting of the maxillary anterior teeth. Especially, the robust 0.9 mm wire is effective in preventing bowing that often occurs in retraction. Therefore, cases with hyperdivergent Class II in which torque control in the anterior teeth and vertical control are important, or cases of gummy smile, open bite, or uprighting incisor are good indications for the system. Additionally, the system is believed effective in reducing lip protrusion accompanied by Class II skeletal malocclusion with long face, because the mandible

rotates counterclockwise.

Recently, both analysis and design have been digitized, and it is possible to create a customized design for the appliance depending on the individual's symptoms. Also, details and the fitting of the pads have been greatly improved and the volume was minimized, all of which reduce patient discomfort (Fig. 2).

Appropriate torque control and vertical control are always required during retraction of the maxillary anterior teeth. In the KILBON system, it is achieved through various locations and lengths of hooks, the angulation of a bar, and the position and selective use of anchorages.

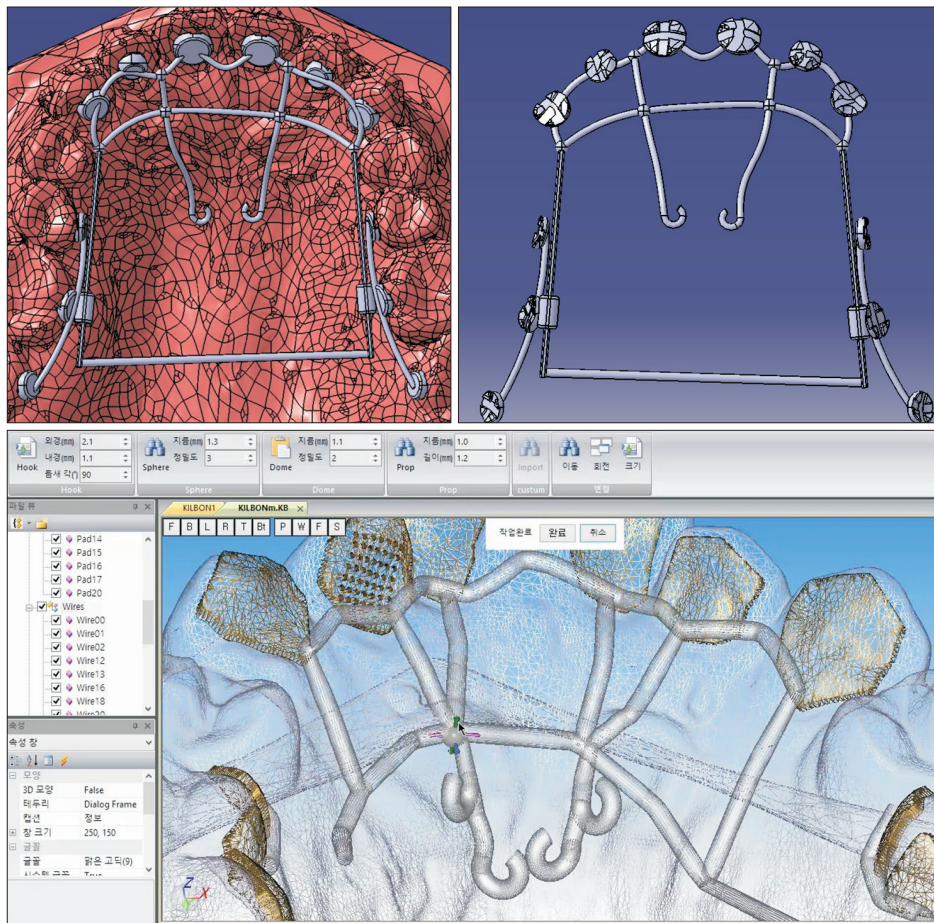
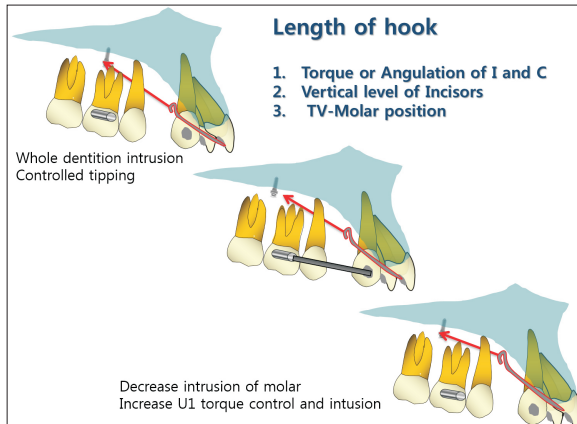
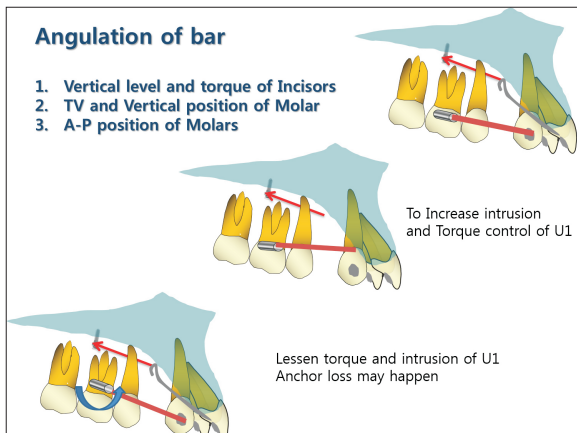


Fig. 2. Analysis using a program custom-built for KILBON and a variety of designs to fit different individuals.

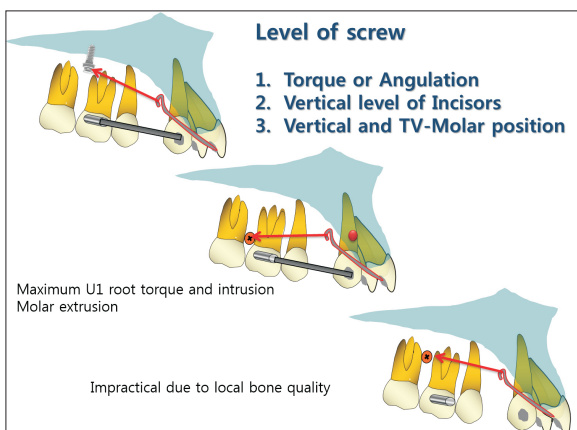
1. Location and length of hook



2. Angulation of a bar



3. Level of screw



By designing and combining various components as shown above, the system makes it possible to make detailed and precise treatment plans and to apply the mechanics according to various symptoms. Also, in treatment practice, the system has advantages of reducing errors and widening the range of control the orthodontist has.

CASE REPORT

1. Case 1

1) Diagnosis

A 33-year-old female patient visited our hospital with a chief complaint of lip protrusion. In clinical findings, there was no asymmetry in the convex profile. The teeth were protruded, which was emphasized by the thick lips. Tension in the chin was seen during lip closure. Gum exposure during smiling was within a normal range. The nasolabial angle was smaller than a normal range, and so was interincisal angle. However, there was no functional abnormality of note. The initial intraoral photos revealed that the spacing in the anterior teeth had been resolved by resin restoration, which showed discoloration. Overall, the size of teeth looked small. A scissor bite was observed due to the malpositioned second premolars on the left.

On the basis of the analysis of lateral cephalogram, the patient was diagnosed Class I malocclusion with dentoalveolar protrusion without skeletal anomalies. The panoramic radiograph showed that #18 and #38 had been removed, that there was no notable periapical lesion, and that the alveolar bones were generally in a good condition. The shape of the condyle was in a good condition both in the right and the left, and clinical testing resulted in no notable clinical finding involving the temporomandibular joint (Fig. 3).

2) Treatment plan

To reduce lip protrusion and control torque in the anterior teeth in an early stage, we planned to extract #14, #24, #34, and #44, use the KILBON system for retraction, and then continue with bracket bonding for align-

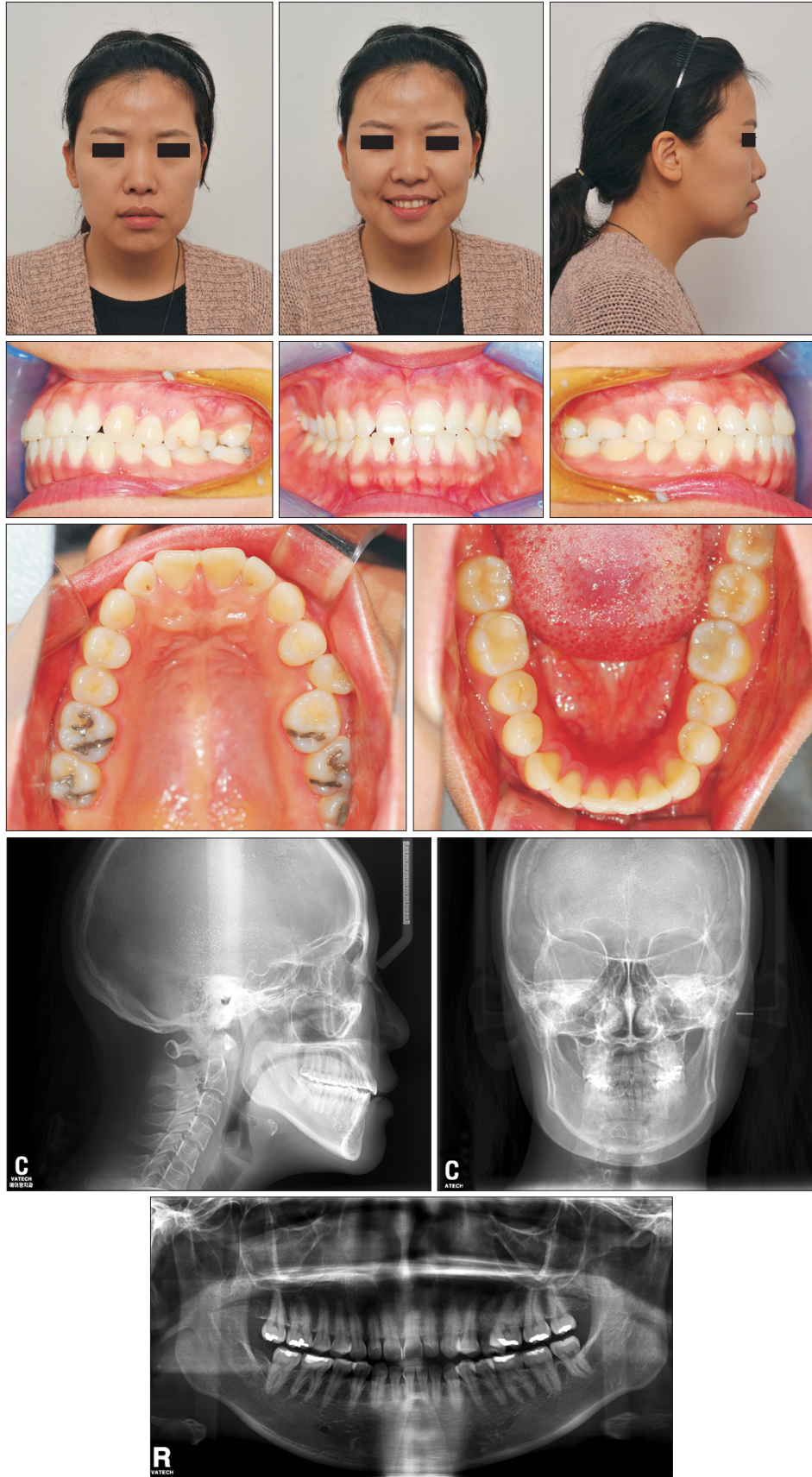


Fig. 3. Initial recording.

ment and leveling to finish. Also, we planned to implant 2 retraction screws in the median region of the palate, and do a follow-up evaluation later on the discolored resin in the anterior teeth and restore if necessary.

3) Treatment process

After 4 first premolars were extracted, impressions were taken to design a KILBON system appliance. In this case, the model was scanned and the appliance was designed on a digital program. The splints were positioned on the lingual surface of both the upper and the lower posterior teeth, and in the anterior teeth

the splint was constructed with a 0.9 mm thick wire and tightly fixed in one piece. The path hole in the posterior teeth was constructed to the same height as the first molar. Two 1.6×8 mm screws were implanted in the median region of the palate. Intraoral bonding was performed in the same manner as with bracket bonding, using putty pads in the anterior teeth (Fig. 4). Temporary teeth were affixed for rehabilitation of the extraction space, and a bite block was put in the maxillary first molar because the mandibular anterior teeth were hitting the maxillary appliance. Retraction was performed using power chain on the same day when

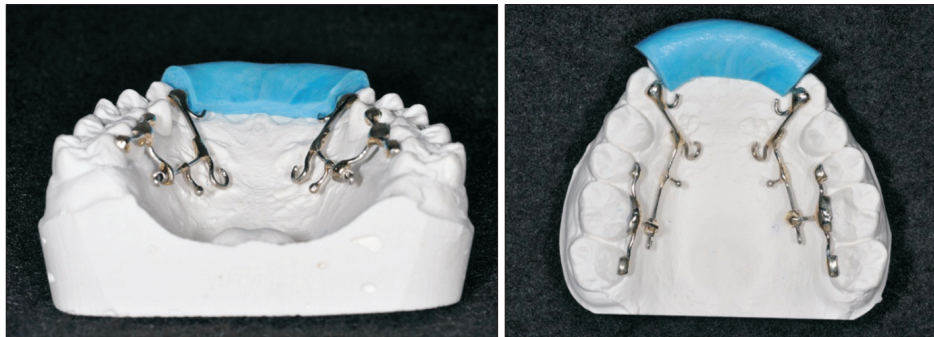


Fig. 4. Intraoral bonding using putty pads.

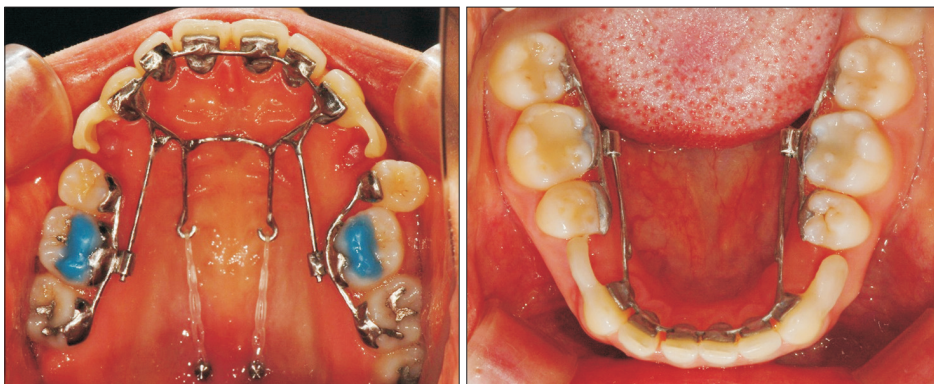


Fig. 5. After temporary teeth were affixed, with appliance bonding retraction began.



Fig. 6. The location of the splint of the mandibular posterior teeth was changed to the labial surface.

the mounting was done (Fig. 5).

With regard to the mandible, the patient complained discomfort in the tongue, so the splint of the posterior teeth was moved to the labial surface. Original spacing was shown in the anterior teeth, because resin between the teeth was removed (Fig. 6).

After 5 mm of space closure, bracket bonding was performed. The patient was satisfied at this point, because lip protrusion was significantly reduced (Fig. 7).

Alignment and leveling were performed in sequence, and the remaining space was closed on a 16×22 SS (Fig. 8).

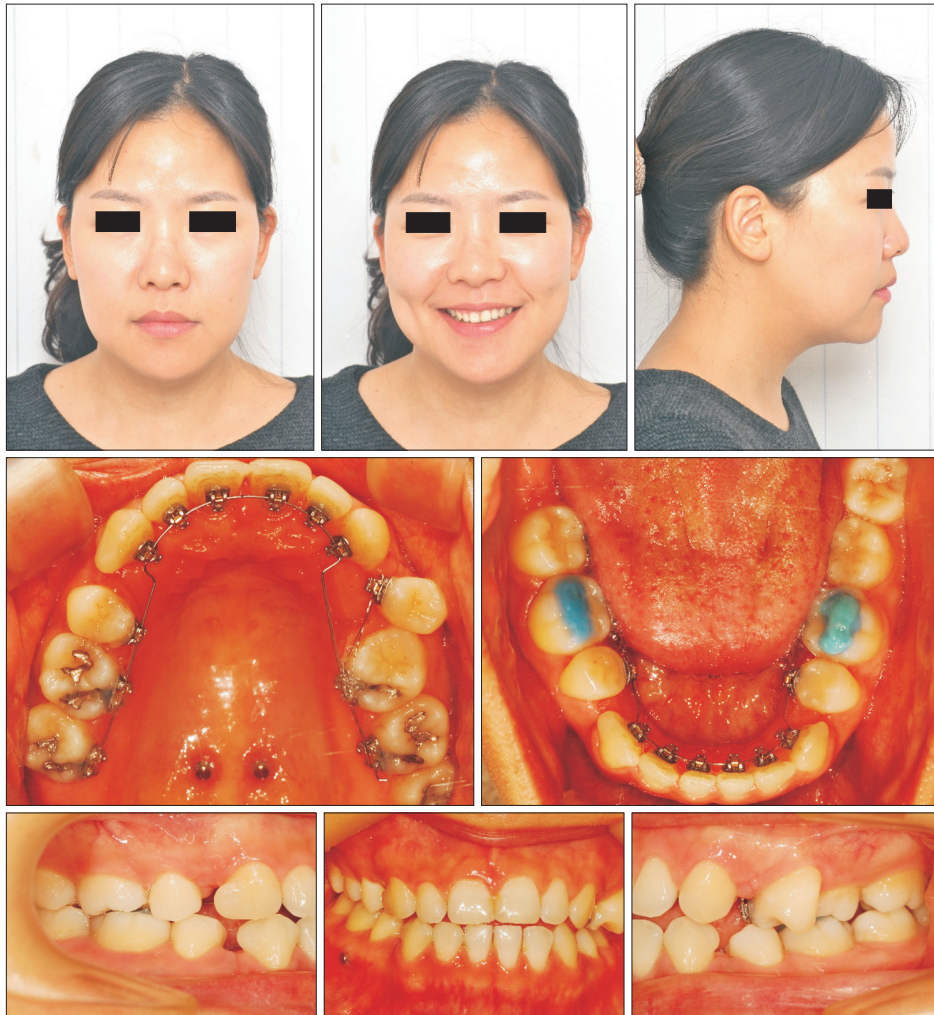


Fig. 7. Intraoral photos showing bracket bonding and morphology, after the KILBON appliance was removed.

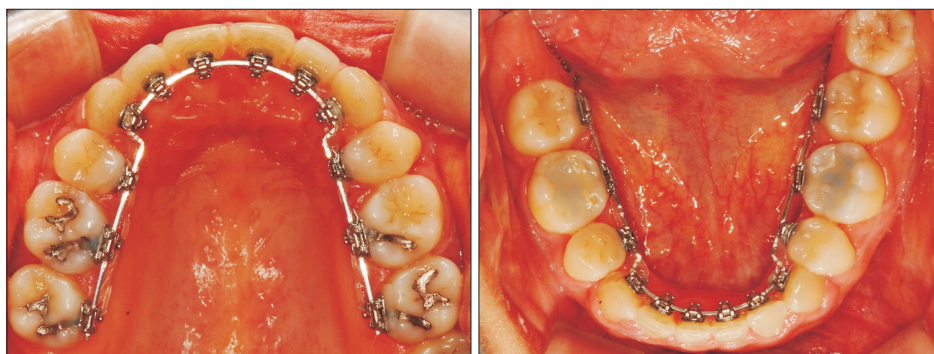


Fig. 8. Remaining space was closed on a 16×22 SS.

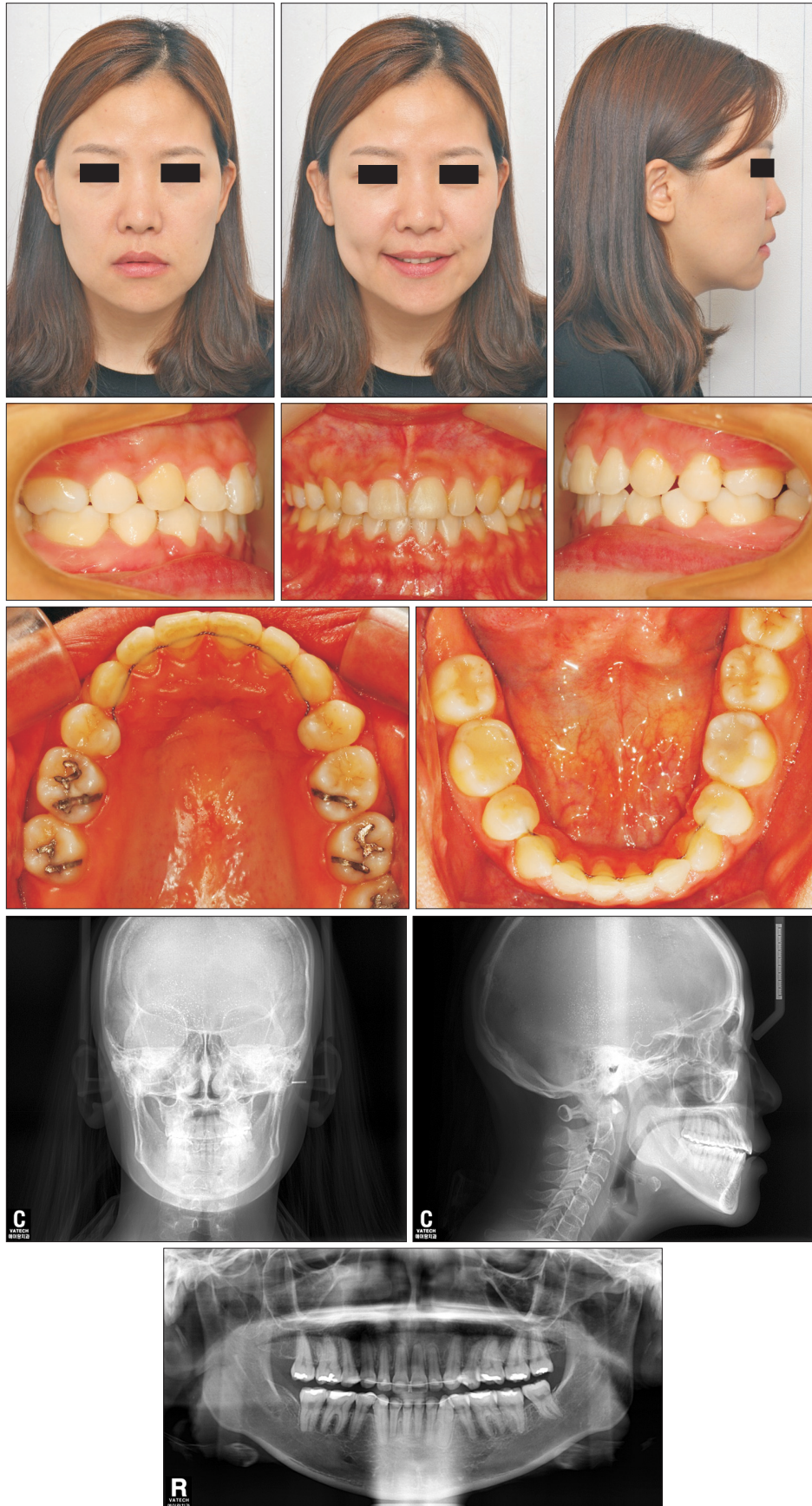
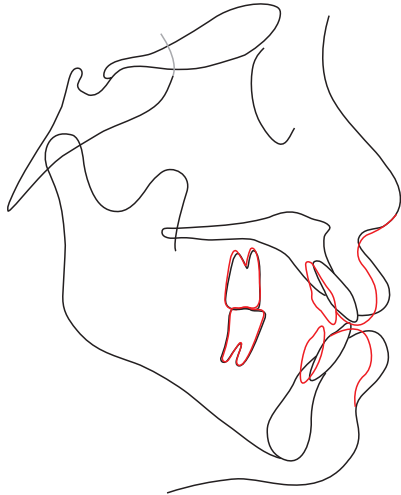


Fig. 9. Recoding after debonding.

4) Treatment results

Lip protrusion, the chief complaint of the patient, was greatly improved, and tension in the chin present prior to the treatment disappeared. The nasolabial angle was improved, and the nose aesthetically looked

higher than before the treatment, because the subnasal area moved back. And, the maxillary and the mandibular anterior teeth, which had been tilted forward, were appropriately aligned. The pre- and post-treatment analysis on lateral cephalogram confirmed ad-



	Initial	final
SNA	86	85
SNB	83	82
ANB	3	3
FMA	26.6	26.4
GONIAL ANGLE	121.8	121.7
Facial height ratio	0.61	0.61
Facial convexity	11.2	8.3
U1 to FH	125.3	114.0
IMPA	95.2	84.0
INTERINCISAL	112.7	135.4

Fig. 10. Superimposition.

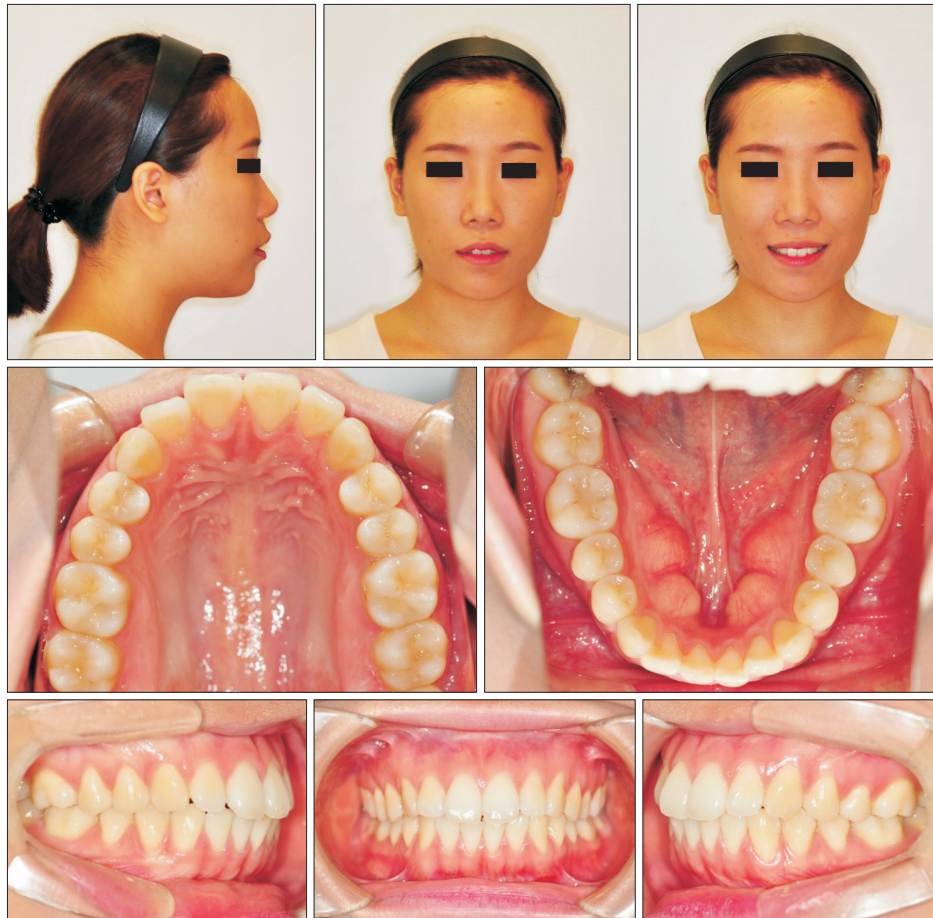


Fig. 11. Initial recording.

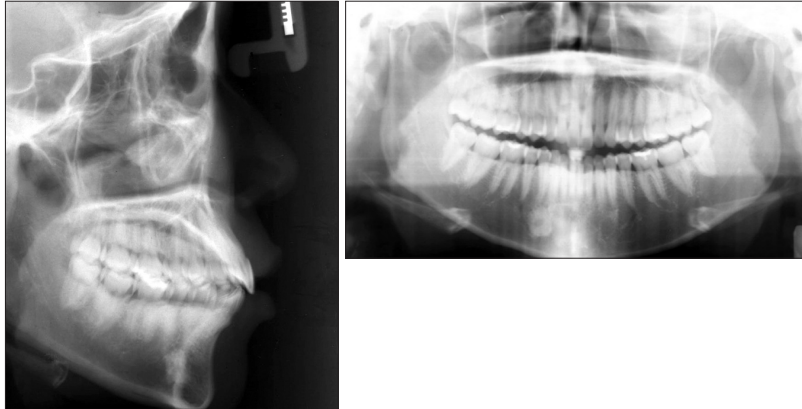


Fig. 11. Continued.

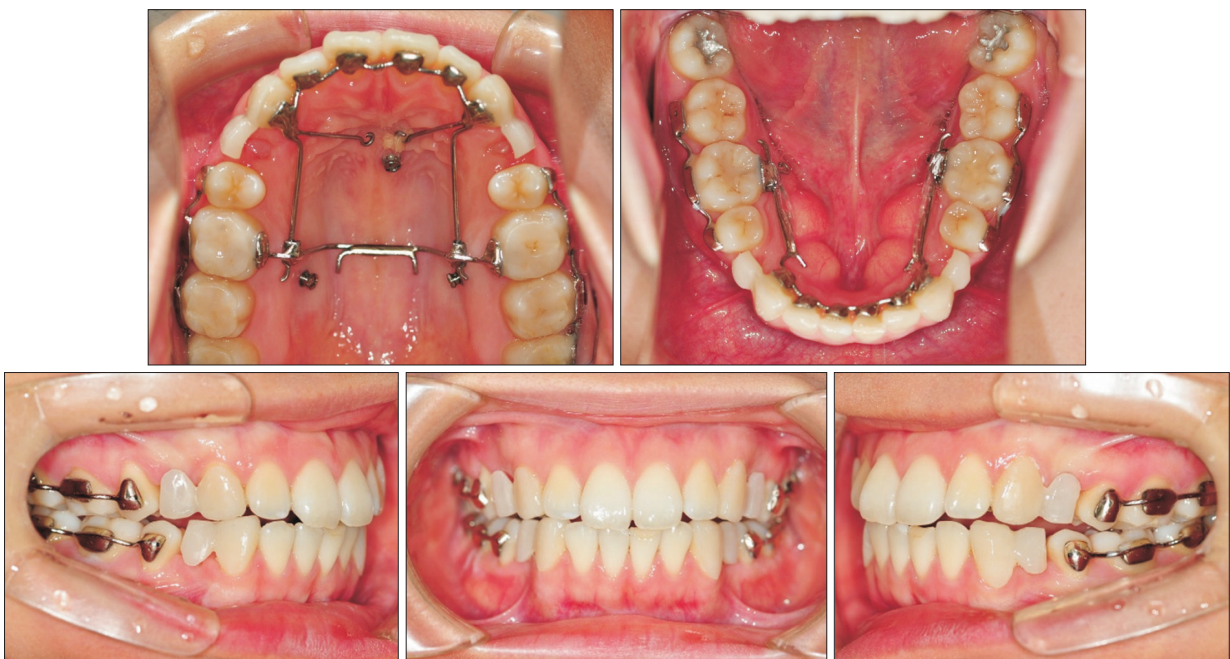


Fig. 12. After the premolars were extracted, a KILBON appliance was fit.

equated torque control in the maxillary anterior teeth, and showed slight intrusion in the mandibular anterior teeth. The panoramic radiograph showed tooth roots were relatively parallel with one another (Fig. 9, 10).

2. Case 2

1) Diagnosis

The patient was a female with a chief complaint of lip protrusion. The convex profile showed a Class 1 skeletal pattern, with no asymmetry in clinical findings. A Class 1 malocclusion was shown and the diag-

nosis was bialveolar protrusion. There was no excess gum exposure during smiling, and also no abnormality to note on the panoramic radiograph. Functional abnormalities were not observed (Fig. 11).

2) Treatment plan

We planned to resolve lip protrusion using a KILBON appliance and palatal screws after extracting the maxillary and the mandibular first premolars, and finish up with bracket bonding.

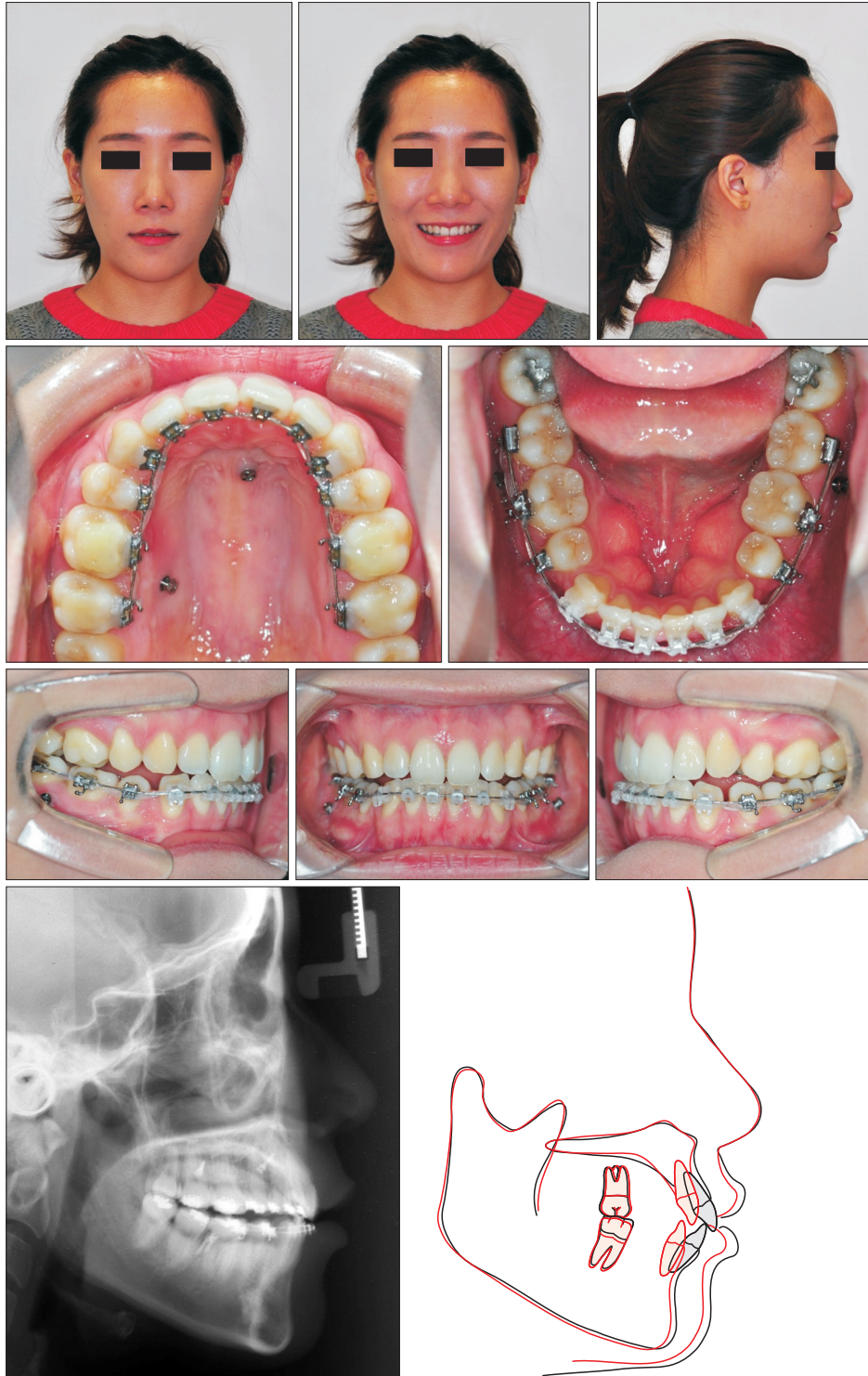


Fig. 13. The KILBON appliance was removed and bracket bonding was performed.

3) Treatment process

The splint of the maxillary and the mandibular posterior teeth was on the labial surface. The tube on the lingual surface was placed on the first molar for retraction (Fig. 12).

After most space was closed, the KILBON appliance was removed and bracket bonding was performed to close the remaining space. At this point, the patient was satisfied with the reduction of lip protrusion, and an adequate torque formation in the anterior teeth

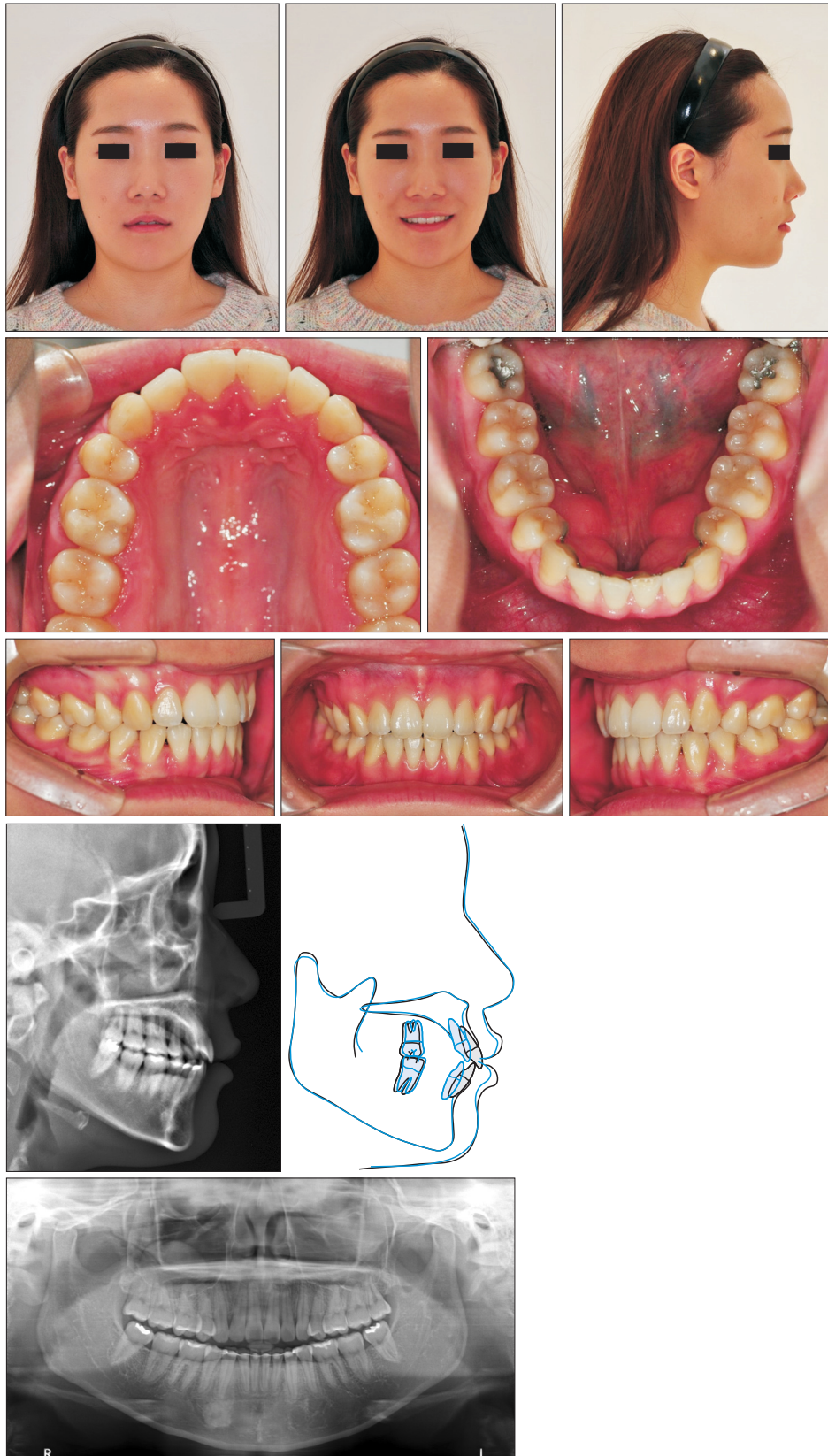


Fig. 14. Recording and superimposition after debonding.

with intrusion was confirmed (Fig. 13).

Finally, space closure was performed on an SS wire to finish and then, debonding was performed (Fig. 14).

4) Treatment results

The patient was satisfied with reduction of lip protrusion, a chief complaint of the patient. The extraction space was closed, as adequate torque was achieved in the anterior teeth. The nasolabial angle was improved, and the location of the A-point area was also improved, which had the effect of making the nose look higher. Stable occlusion was achieved, and appropriate overjet and overbite were formed. On the panoramic radiograph, the tooth roots were relatively parallel with one another, and severe root resorption was not seen.

DISCUSSION AND CONCLUSION

Patients who visit office with lip protrusion as a chief complaint have a strong aesthetic desire to reduce protrusion. Moreover, they want the treatment to complete as soon as possible and the appliance to be less noticeable during treatment, for aesthetical reasons. From this perspective, it would be more favorable if a treatment approach supplements aesthetics

by addressing the chief complaint, protrusion, in treatment as early as possible and fitting the appliance on the lingual surface. This case study used the KILBON system, one of several methods for such treatment approach, and effectively treated the patients by resolving protrusion early and minimizing patient rejection of the appliance. Additionally, with the system it was possible to control torque as intended because torque loss in the maxillary anterior teeth was minimized during retraction, and also possible to shorten the treatment length. In this study, we used an early model of the KILBON appliance that was digitally fabricated. Recently, it has been made possible to construct more detailed designs and appliances specific to different individuals. In addition, in terms of the mechanics, digital application allows such controlling components as length and location of hooks, angulation of bars, and location of screws to be applied in a variety of fashion, which enables the orthodontist to make a detailed and precise treatment prediction and execute it. Thus, indications for which the system can be used for treatment is quite wide. Specifically, as discussed earlier, cases in which torque control and delicate vertical control are essential such as hyperdivergent Class II, gummy smile, open bite, or uprighting incisor are good indications.