

Vertical Control by Combining a Monoblock Appliance in Adult Class III Overclosure Treatment

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ABSTRACT

Monoblock appliances were used in combination with intermaxillary elastics for treatment of adult skeletal Class III patients. The patients showed predisposing upper incisors problems, significant mobility in patient 1 and root resorption in patient 2, which contraindicated direct intrusion of the incisors. Using the monoblock with selective extrusion of the molars, a clockwise rotation was induced to reduce overbite and to achieve a better profile. It was also possible to reduce the excessive force to the upper incisors during and after treatment, which improved incisor mobility to a physiologic extent (patient 1) and prevented further progression of root resorption (patient 2). Stability was high after the 2-year follow-up, which suggests a stable vertical control approach by using the monoblock appliance in combination with a fixed appliance in adults. (*Angle Orthod* 2006;76:226–235.)

KEY WORDS: Monoblock; Vertical control; Overclosure

INTRODUCTION

Among the well-recognized treatment methods to raise excessive overbite, intrusion of the anterior teeth using a fixed appliance is reported to show the highest postretention stability.¹ However, sometimes deep bites caused by overclosure of mandible are encountered, and in these patients clockwise rotation of mandible is the reasonable treatment of choice for functional² or esthetic (or both) reestablishment of appearance and function. This is especially true when additional predisposing periodontal or dental problems are present in the incisors, which makes it quite difficult to control the vertical relationship solely by wire adjustment. Therefore, we report two cases of adult skeletal Class III patients treated using the monoblock appli-

ance together with the fixed appliance to control the vertical relationship by the clockwise rotation of the mandible (Figure 1).

PATIENT 1: SKELETAL CLASS III LOW ANGLE CASE WITH PATHOLOGICAL MOBILITY OF THE UPPER CENTRAL INCISORS

Diagnosis and treatment progress

A 37-year 8-month-old female was presented with a chief complaint of “severe mobility of the upper inci-

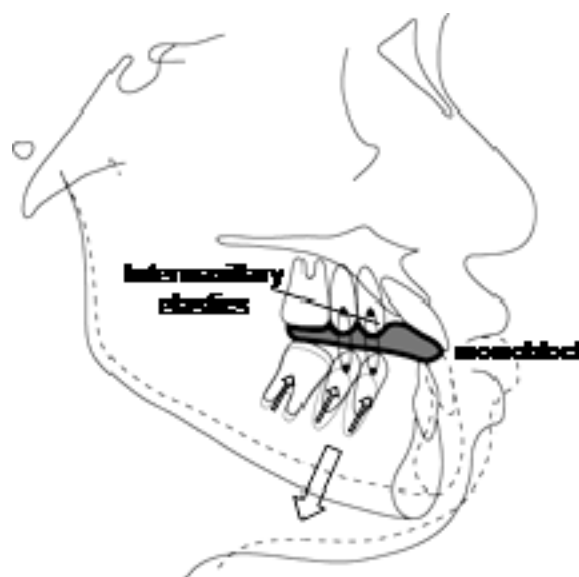


FIGURE 1. Biomechanics for mandibular clockwise rotation using the monoblock appliance.

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FIGURE 2. Patient 1: pretreatment extraoral and intraoral photographs.

sors.” The patient had a unique history of self-correcting an anterior crossbite by pulling the upper central incisors labially using her own fingers. A severe labiolingual mobility (mob[+++]) using a mobility test) of the upper central incisors was present, possibly because of traumatic occlusion of the anterior teeth.³ Intraorally, the patient showed a mild Class III molar relationship, retroclined lower incisors, with a deep curve of Spee. She was diagnosed as skeletal Class III

(ANB-5°) with a low mandibular plane angle (21°) and excessive overbite (+6 mm) (Figures 2 and 3).

To reduce the anterior deep bite and to avoid excessive force on the upper incisors, we planned to initially use a monoblock appliance along with the lower sectional archwire. Instead of applying intrusive force directly to the upper central incisors, vertical intermaxillary elastics were used in the premolar region in combination with the monoblock to reduce the curve of



FIGURE 3. Patient 1. (a) Pretreatment cephalometric radiograph and (b) periapical radiograph of the upper incisors. Note the significantly low mandibular plane angle, which results in a hypodivergent profile.



FIGURE 4. Patient 1: simultaneous use of the monoblock and intermaxillary elastics during treatment.

Spee and for positive extrusion of the lower molars to produce a clockwise rotation of the mandible.

Mode of action

The monoblock appliance construction bite was prepared by opening the mandible 4 mm vertically from the intercuspal position. The monoblock was designed and fabricated to be used simultaneously with the fixed appliance while sleeping. The average time of use was 8 hours per day. The acrylic surface was adjusted and ground to allow extrusion of the mandibular

premolars/molars using vertical intermaxillary elastics. The force of the intermaxillary elastics was approximately 100 gf (Figure 4). The insertion of an archwire into the upper incisors was delayed until the bite was raised using the monoblock appliance.

Results

After 24 months of active treatment, the overbite was reduced from 6 to 3 mm (Figure 5), and the mobility of the upper central incisors decreased to a physiologic range (mob [+]). The mandible was rotated clockwise with a 3° increase in the mandibular plane angle (from 21° to 24°, Figure 6). Furthermore, during the 24-month retention period, the anterior overbite and mandibular plane angle were highly stable (Figure 7). No signs or symptoms of temporomandibular dysfunction were noted during treatment or in the 2-year follow-up.

PATIENT 2: CLASS III ANTERIOR CROWDING CASE ASSOCIATED WITH APICAL ROOT RESORPTION OF THE UPPER INCISORS

Diagnosis and treatment progress

A 26-year 8-month-old female was presented with a chief complaint of "anterior crowding." She showed a concave profile with severe crowding and negative



FIGURE 5. Patient 1: posttreatment extraoral and intraoral photographs. Overbite was reduced from +6 to +3 mm.

overjet (Figure 8). A periapical radiograph of the upper incisors revealed short roots with mild apical blunting (Figure 9b). Although she had a severe Class III skeletal pattern, her molar relationship showed a mild Class III, possibly because of the mesial drift of upper molars creating severe upper crowding. She was diagnosed as skeletal Class III (ANB-6°) with a low mandibular plane angle (18°) (Figure 9a).

Although orthognathic surgery combined with orthodontics was suggested, the patient asked for a non-

surgical treatment. Therefore, to relieve crowding, four first premolars were extracted, and orthodontic treatment was started. However, to prevent anterior overload during bite control, we used the monoblock appliance instead of applying an intrusive force directly to the upper central incisors. The upper incisors were bonded, but the archwire was passively bent to avoid contact with the anterior bracket until the bite was raised. As in case 1, vertical intermaxillary elastics were used in the premolar region with the monoblock

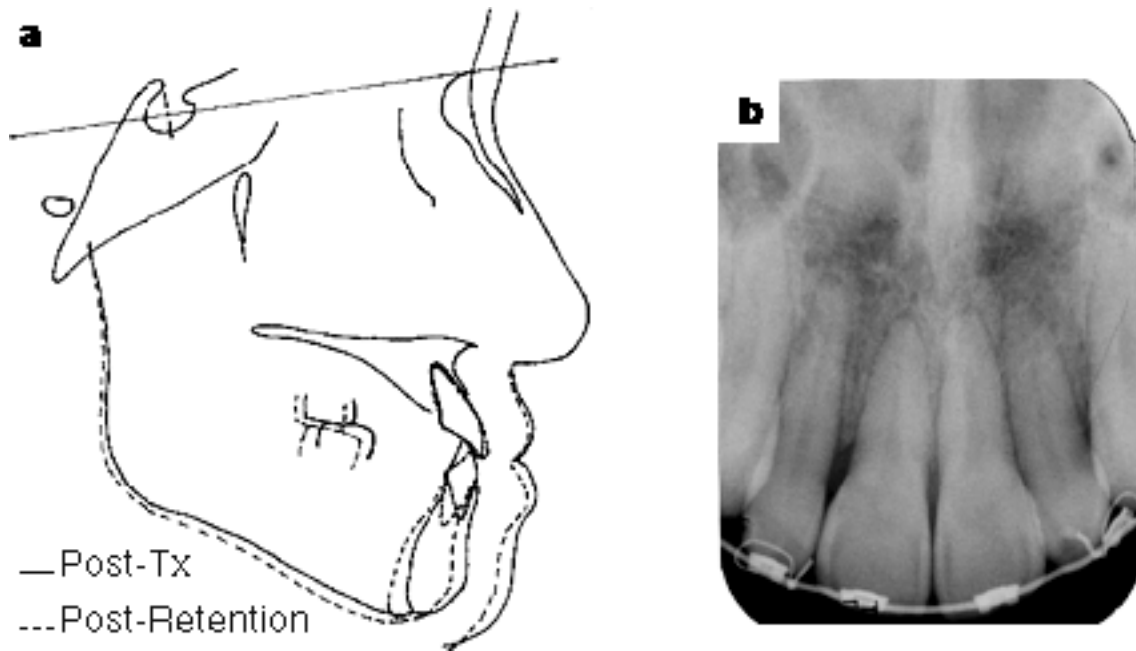


FIGURE 6. Patient 1. (a) Pre- and posttreatment cephalometric superimposition. There was a clockwise rotation ($+3^\circ$) of mandible. (b) Post-treatment periapical radiograph of the upper incisors; just before debonding.

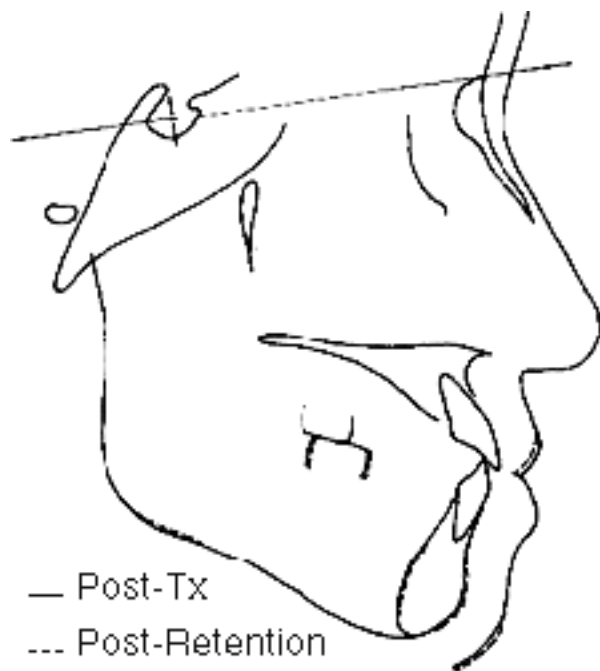


FIGURE 7. Patient 1: posttreatment and postretention cephalometric superimposition.

for relative intrusion (Figure 10). The average time of use was 9 hours per day.

Results

After 24 months of active treatment, an excellent occlusion was achieved (Figure 11). The mandible un-

derwent a clockwise rotation with a 4° increase in the mandibular plane angle (from 18° to 21° ; Figure 12a). During active treatment, we could not detect any progression of the apical root resorption on the central incisors (Figure 12b). Furthermore, after the 24-month retention period, the anterior overbite and the mandibular plane angle were stable without any noticeable relapse (Figure 13). A genioplasty was suggested during and after treatment to reduce the prominent chin, but the patient was satisfied with her looks and refused surgical correction. No signs and symptoms of temporomandibular dysfunction were noted during treatment or in the 2-year follow-up.

DISCUSSION

Etiology and benefits of vertical control in patient 1

The case for the significant mobility of the upper central incisors was quite unique. Patient 1 had a history of anterior crossbite before she undertook the self-correction using her own fingers. Although dental compensation was induced, her skeletal Class III pattern still remained unchanged, possibly causing excessive force to the upper anterior teeth. This problem is not limited to crossbite patients, and excessive occlusal pressure from the lower incisors can induce traumatic occlusion.⁴ Proper vertical control with orthodontic treatment is believed to reduce the possibilities for traumatic occlusion of this kind.⁵

As important as it is, controlling vertical dimension

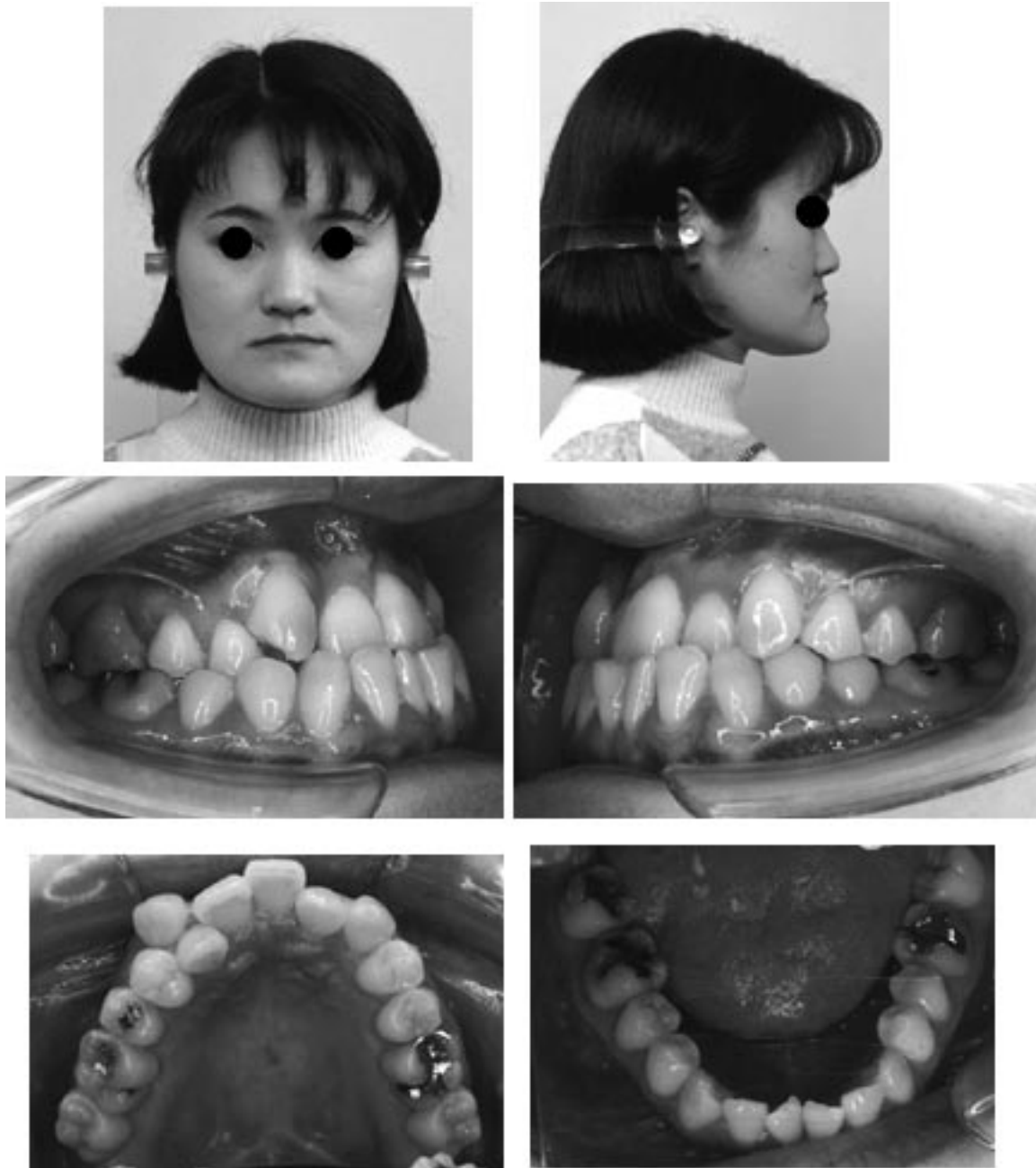


FIGURE 8. Patient 2: pretreatment extraoral and intraoral photographs.

is still considered to be very difficult in adults using conventional techniques.⁶⁻⁹ With the treatment, reported in this study, that combines the monoblock appliance with conventional treatment, reduction of the anterior overbite was successfully achieved, which also stabilized the incisor mobility. If the incisors were left untreated, the persistent trauma from occlusion could have resulted in a poor prognosis, which may threaten the life span of the incisors in the long term.¹⁰⁻¹²

Vertical control after extraction in patient 2

In premolar extraction patients, bite deepening may occur without the proper vertical control during space closure.¹³ In addition, a decrease in the total number of teeth supporting the occlusal force may also contribute to deepen overbite during and after active orthodontic treatment, accentuating traumatic occlusion. For these reasons, correction or prevention of bite

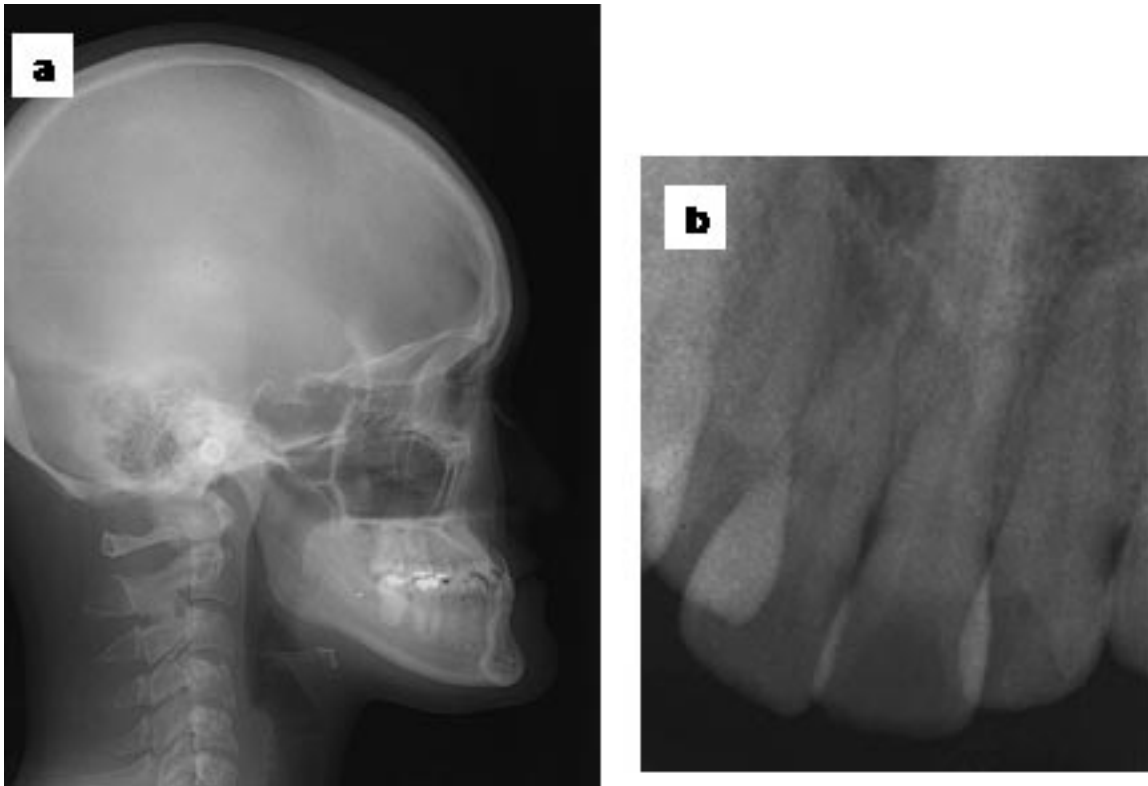


FIGURE 9. Patient 2. (a) Pretreatment cephalometric radiograph. Note the skeletal Class III profile with low mandibular plane angle. (b) Periapical radiograph of the upper incisors indicating short root and apical blunting of the central incisors.



FIGURE 10. Patient 2: simultaneous use of the monoblock and intermaxillary elastics after extraction.

deepening during active treatment and maintaining the correction throughout the retention period are especially emphasized in extraction patients.¹⁴

In nongrowing adults, deep bite can be controlled conventionally by intrusion of the mandibular incisors, flattening the curve of Spee, or intrusion of the maxillary incisors by simultaneous use of extraoral appliances such as J-hook headgears.¹⁵ However, in this case, apical blunting of the upper central incisors was observed during the diagnostic evaluation.

Because applying an intrusive force directly to the incisors may exacerbate the apical root resorption,^{16,17} we planned to use the monoblock appliance along with the fixed appliance to extrude the molars, which would result in a relative intrusion of the anterior tooth. Patient 2 had a low mandibular plane angle with a counterclockwise rotation of the mandible, which allowed us to change mandibular position by a clockwise rotation. Analysis of the pre- and posttreatment cephalometric superimposition indicates that despite slight elongation of the maxillary incisors, the overbite did not increase during the treatment period. This also indicates that the occlusal force transmitted to the upper incisors was successfully controlled during treatment. Apical root resorption did not progress during treatment or the 2-year retention period.

Long-term stability

For many years, the postretention stability of deep overbite treatment has been discussed broadly.¹⁸ To reduce overbite using the fixed appliance, intrusion of the incisors is commonly indicated. Compared with the high level of long-term stability in patients treated by intrusion of the incisors,¹⁹ reducing overbite by extrusion of the molar and the premolar region using functional appliance or cervical headgear in adults is re-



FIGURE 11. Patient 2: posttreatment extraoral and intraoral photographs.

ported to have a high risk of relapse. Maxillofacial morphology and positional interrelationship are reported to be developed or maintained by the balance of functional stresses exhibited by the neuromuscular and soft tissues, etc, of the stomatognathic system.²⁰ On the basis of this theory, some argue that orthodontic/orthognathic treatment alters this balance, which would eventually result in a relapse.

However, in the two patients, decreased overbite and a clockwise-rotated mandibular position were stable during the follow-up. The first possible reason for the stability would be the long-term use of bite

plate-type retainers. By using the bite plate once a week even after the 2-year of retention period, the overbite was successfully maintained without any noticeable relapse. This suggests that the vertical stability of occlusion can be effectively maintained by establishing a long-term retention period with simple additional appliances.^{21,22} A second explanation would be the fact that treatment was performed on nongrowing adults. Although orthodontic or orthopedic forces can modify the direction and amount of maxillofacial growth in growing individuals, we often experience relapse during retention or postretention

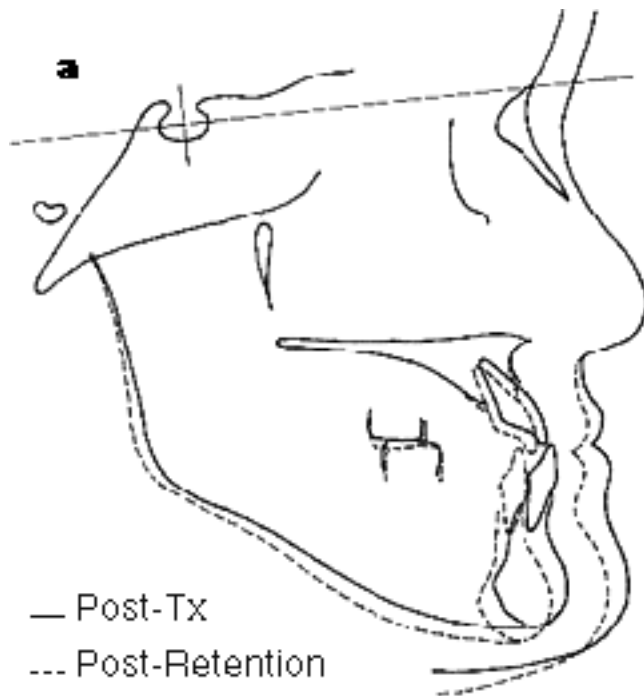


FIGURE 12. Patient 2. (a) Pre- and posttreatment cephalometric superimposition. There was clockwise rotation ($+3^\circ$) of the mandible. (b) Posttreatment periapical radiograph of the upper incisors. No sign of progressed apical root resorption was detected.

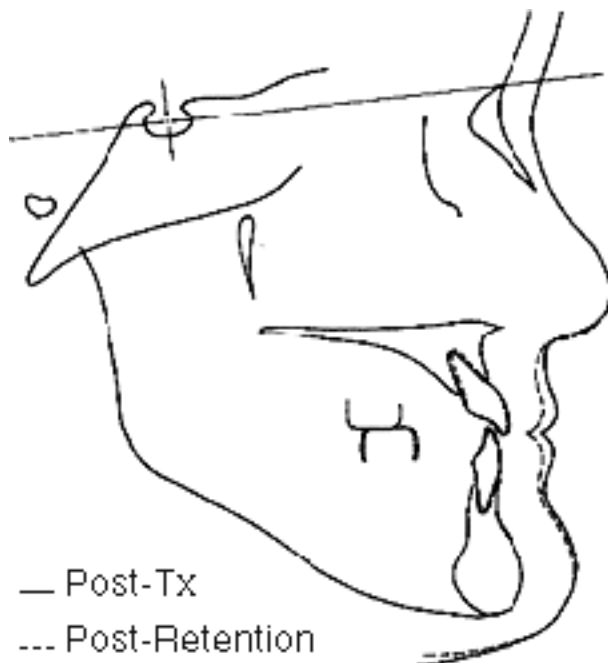


FIGURE 13. Patient 2: posttreatment and postretention cephalometric superimposition. During the retention period, overbite and the mandibular plane angle were maintained without any noticeable relapse.

period in favor of the primary genetic growth potential. In these two patients, actively extruded premolars/molars may have been stable according to the same simple principle of orthodontic tooth movement; it is much more difficult to intrude a tooth than to extrude one.²³

CONCLUSIONS

- Deep bite was effectively treated with long-term stability using the monoblock appliance in combination with vertical elastics.
- This system can especially be emphasized in adult patients associated with predisposing incisor problems, such as root resorption and severe mobility.

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