

CASE REPORT

Facial Improvements after Molar Intrusion with Miniscrew Anchorage

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Orthodontists have tried various methods of intruding the posterior teeth to correct skeletal open bite, including tongue cribs,¹ high-pull headgear,² posterior bite blocks,³ active vertical corrector magnets,⁴ and multiloop edgewise archwires⁵ (MEAW). Because these have shown limited effectiveness in terms of profile correction and long-term stability, however, skeletal open bite has traditionally been treated with a

combination of orthodontics and orthognathic surgery, such as Le Fort I osteotomy with maxillary posterior impaction.

The recent development of orthodontic miniscrews has made it possible to achieve stable correction of open bite with orthodontics alone. Umemori and colleagues reported a case in which a skeletal open bite was corrected by intrusion of the posterior teeth, using titanium miniplates

for anchorage.⁶ The long-term stability of molar intrusion for the correction of open bite is still controversial; Sugawara and colleagues reported one-year relapse rates of 27.2% for first molars and 30.3% for second molars, although the skeletal changes were maintained.⁷

This article demonstrates a stable correction of a skeletal open bite using posterior intrusion with miniscrew anchorage.



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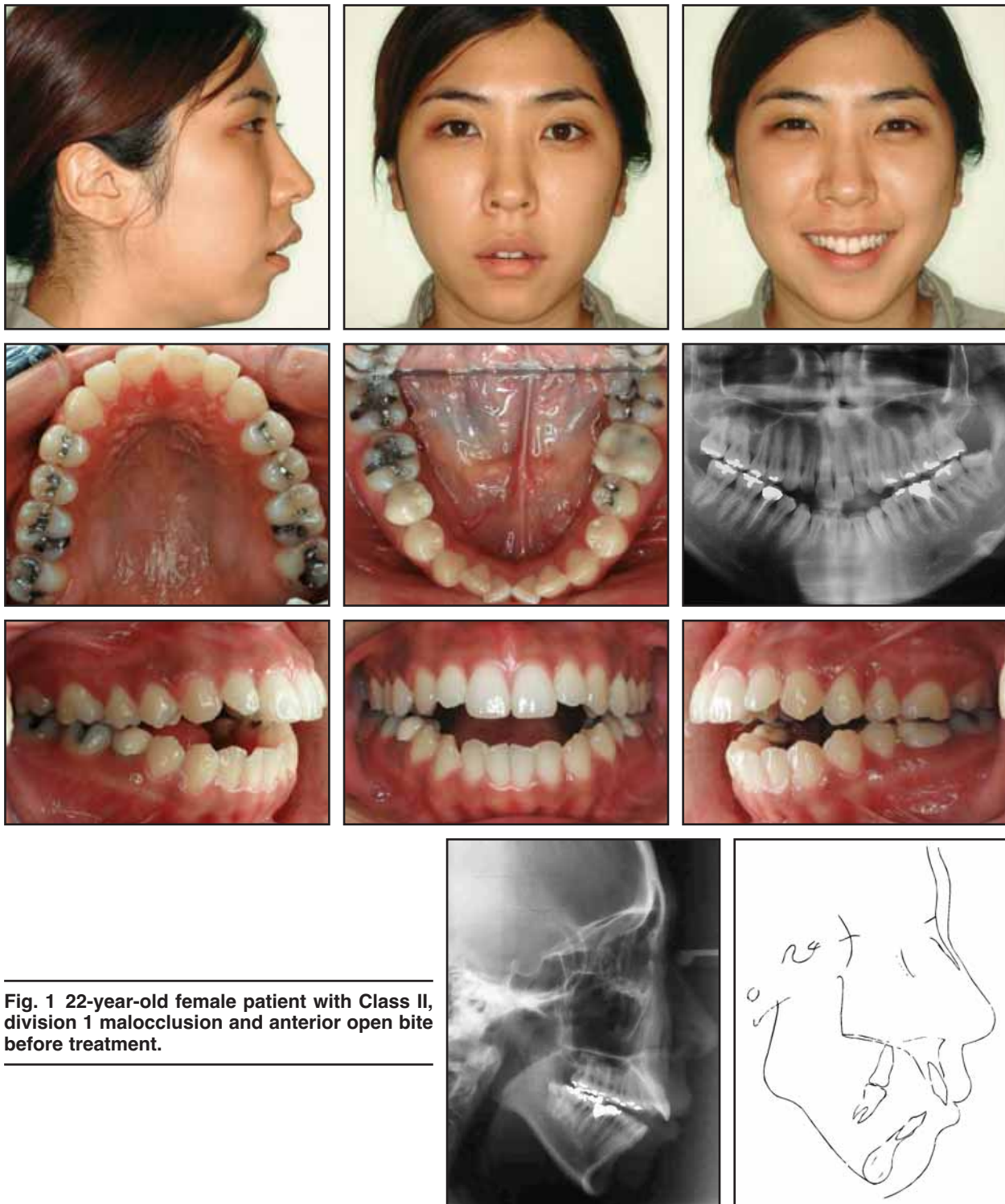


Fig. 1 22-year-old female patient with Class II, division 1 malocclusion and anterior open bite before treatment.

Diagnosis

A 22-year-old female presented with the chief complaints of an anterior open bite and a retrognathic mandible (Fig. 1). She reported having experienced TMJ pain three years earlier, and clinical examination revealed clicking in both joints. Cast analysis revealed a Class II, division 1 malocclusion with an end-on Class II molar relationship, -4mm of overbite, and 5mm of overjet. The upper arch was well aligned, but the lower arch demonstrated 3.5mm of crowding. Cephalometric analysis (SNB = 64°, ANB = 11.5°, MPA = 59°) indicated a skeletal Class II pattern with an open bite (Table 1).

The extraoral photograph with the posterior teeth in occlusion demonstrated severe lip incompetence. In the frontal view, the incisal exposure was excessive, with 6mm of incisal edge exposure in the resting lip position. Neither the ratio of philtrum height to commissure height (ideal = 1:1) nor the vertical proportion of the lower facial third (subnasale-Stms/Stmi-menton, ideal = 1:2) was ideal.⁸ The profile view showed a retrognathic mandible with an obtuse (122°) lip-chin-throat angle and a posteriorly positioned chin. The acute nasolabial angle accentuated the retrognathic profile. Because the typical features of skeletal open bite with a high mandibular plane angle in this patient were due to the severe clockwise rotation of the mandible, the focus of treatment was to rotate the mandible in a counterclockwise direction.

Treatment Plan

Three main treatment objectives were established: closure of the anterior open bite, relief of lip incompetence, and improvement of the retrognathic facial profile.

The patient was presented with two treatment alternatives. One was a surgical approach,

including a Le Fort I maxillary osteotomy, with posterior impaction to correct the open bite; and mandibular advancement and autorotation, with bilateral sagittal split-ramus osteotomy to improve the position of the retrognathic mandible. The other option was to intrude the posterior teeth, using miniscrew

TABLE 1
CEPHALOMETRIC DATA

	Pre-treatment	After Intrusion	Post-Treatment
<i>Hard-Tissue Measurements</i>			
<i>Dental</i>			
SN-U1	95.0°	93.0°	88.0°
IMPA	94.0°	99.0°	87.0°
PP-U6	25.0mm	22.0mm	23.0mm
MP-L6	40.0mm	38.0mm	39.0mm
<i>Skeletal</i>			
SNA	75.5°	75.5°	75.5°
SNB	64.0°	67.0°	67.0°
ANB	11.5°	8.5°	8.5°
MPA (to SN)	59.0°	54.0°	54.0°
<i>Soft-Tissue Measurements</i>			
<i>Frontal</i>			
Philtrum height	17.0mm	18.0mm	18.5mm
Commissure height	19.5mm	18.0mm	19.0mm
Philtrum/commissure ratio	1:1.14	1:1.02	1:1.02
Upper 1/3	17.0mm	18.0mm	18.5mm
Lower 2/3	27.0mm	28.5mm	30.5mm
Vertical proportions	1:1.58	1:1.58	1:1.64
<i>Lateral</i>			
Nasolabial angle	85.0°	88.5°	96.0°
Lip-chin-throat angle	122.0°	116.5°	110.5°
Soft-tissue pogonion (to FH-N perpendicular)	14.0mm	12.0mm	12.0mm

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anchorage, to correct the anterior open bite and induce a counterclockwise rotation of the man-

dible. This would bring pogonion into a more anterosuperior position, improving the retro-

gnathic profile and changing the molar relationship from end-on Class II to Class I.



Fig. 2 Patient after placement of two midpalatal miniscrews and two miniscrews in mandibular buccal alveolus.

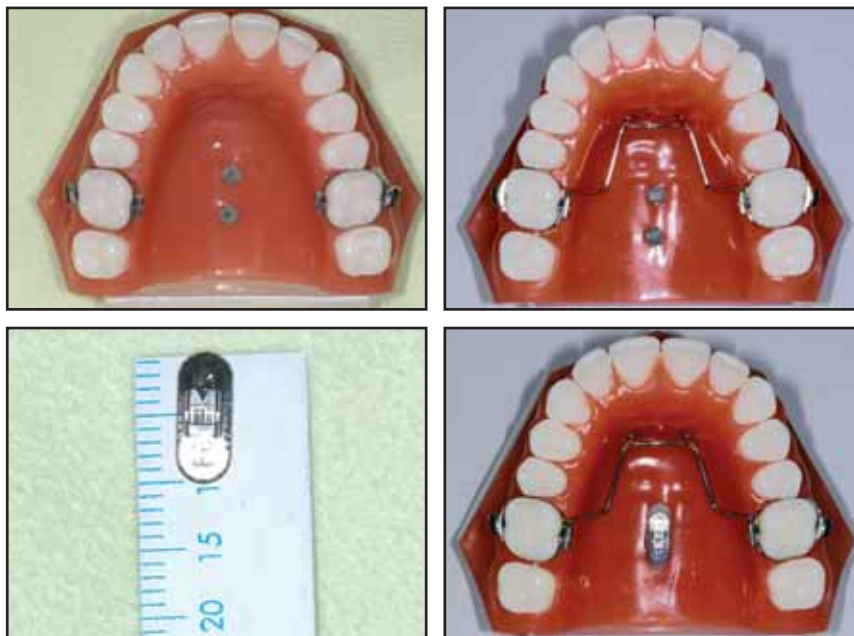


Fig. 3 S-sheath fabricated by welding lingual sheath to metal base and bonded over midpalatal miniscrews with flowable composite resin.

The patient chose the non-surgical option with the understanding that it might not result in as much skeletal improvement as the surgical option. To address the lip protrusion, four premolar extractions were planned after completion of the posterior intrusion, which would change the sagittal relationship of the patient's profile.

Treatment Progress

Orthodontic miniscrews were placed on either side of the midpalatal suture and in the buccal alveolus between the mandibular second premolars and first molars^{9,10} (Fig. 2). The two maxillary miniscrews were splinted with self-curing resin for security and bonded with an S-sheath to

intrude the posterior teeth with elastomeric chain¹¹ (Fig. 3). The posterior teeth in both arches were splinted with fiber-reinforced composite so they could be intruded as single units. In the maxilla, a modified transpalatal arch with expansion and buccal torque was used to counteract intermolar constriction and palatal tipping of the posterior teeth during intrusion; in

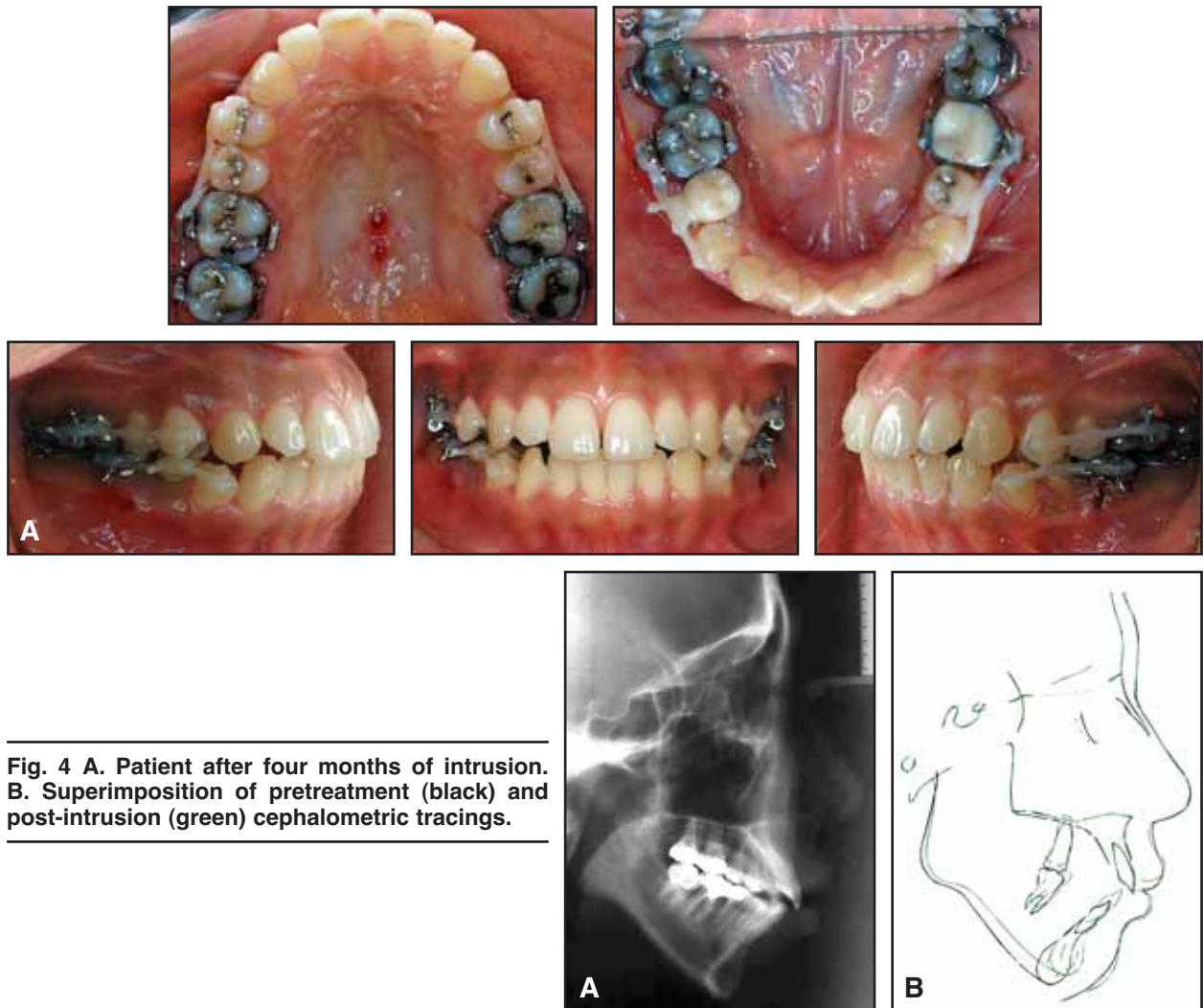


Fig. 4 A. Patient after four months of intrusion. **B.** Superimposition of pretreatment (black) and post-intrusion (green) cephalometric tracings.

the mandible, a lingual arch with constriction and lingual torque was used to counteract intermolar expansion and buccal tipping of the posterior teeth. After four months of posterior intrusion, the open bite was corrected with ideal overbite and overjet (Fig. 4).

SNB increased from 64° to 67° due to the counterclockwise rotation of the mandible, and soft-tissue pogonion moved anteriorly by 2mm relative to the FH-N perpendicular (Table 1). Anterior facial height decreased concomitantly with the decrease in MPA. In addition, the ratio of philtrum height to commissure height approached the ideal ratio of 1:1, owing to a reduction in muscular tension. The tension of the mentalis muscle disappeared, the lip-chin-throat angle decreased to about 116° , and the occlusal plane became steeper. A Class I molar relationship was achieved. Although the intrusion of the posterior teeth corrected the patient's open bite and improved the high-angle pattern, it did not eliminate the lip protrusion, and a 1mm posterior open bite appeared.

Posterior contacts were then established by eruption of the upper and lower molars. After removal of the miniscrews, the upper first premolars and lower second premolars were extracted. To maintain the torque in the maxillary anterior teeth, .018" brackets* were placed on the anterior teeth and .022" brackets* on the posterior teeth. En masse retraction using sliding mechanics was performed with an .018" \times .025" maxillary stainless steel archwire and an .016" \times .022" mandibular stain-

less steel archwire.

No relapse of the open bite was observed during this period, even though the intrusive force had been discontinued. About 10 months later, the brackets were debonded, and fixed lingual retainers were placed in both arches. A maxillary wraparound retainer with a posterior bite block was also delivered.

Treatment Results

The overall duration of active treatment was 21 months. Treatment achieved a Class I occlusion with normal overbite and overjet (Fig. 5). The premolar extractions produced a dramatic improvement in the patient's profile, primarily by increasing the nasolabial angle. Counterclockwise rotation of the mandible led to an increase in SNB, a reduction in MPA, and an anterosuperior movement of pogonion (Table 1).

In the superimpositions of initial and final cephalometric tracings, alveolar height was measured from the palatal plane to the central fossa of the maxillary first molar, and from the mandibular plane to the central fossa of the mandibular first molar. Because of the superimposition of images of the right and left first molars on the lateral cephalograms, the first molars were traced between the two images. The counterclockwise rotation of the mandible was measured using the angle between the mandibular and SN planes. This angle decreased from 59° to 54° , showing the extent of posterior intrusion.

Discussion

The case shown here demonstrates that orthodontic treatment alone can effectively correct a skeletal open bite with a high mandibular plane angle, which has traditionally been treated with orthognathic surgery.

The correction of the anterior open bite resulted from a reduction in posterior dentoalveolar height, rather than extrusion of the anterior teeth. The improvement in the nasolabial angle and the correction of lip protrusion were largely due to the retraction of anterior teeth after the premolar extractions. In addition, it appeared that the reduction in anterior facial height relieved soft-tissue tension, resulting in an increase in philtrum height and thus a more consonant lip arc at rest. This improved ratio was maintained even after retraction of the anterior teeth. In the lower facial third, the change in the ratio of upper-lip to lower-lip length after the extractions improved the patient's esthetic appearance.⁸ Finally, a slight intrusion of the maxillary anterior teeth reduced the incisal exposure that remained after the initial intrusion, producing a more esthetic smile line.¹²

The vertical relapse noted by Sugawara and colleagues⁷ was not observed as of 18 months after debonding, a total of two years and five months after the intrusive force was discontinued (Fig. 6).

*Clarity Aesthetic Brackets with MBT prescription, trademarks of 3M Unitek, 2724 S. Peck Rd., Monrovia, CA 91016.

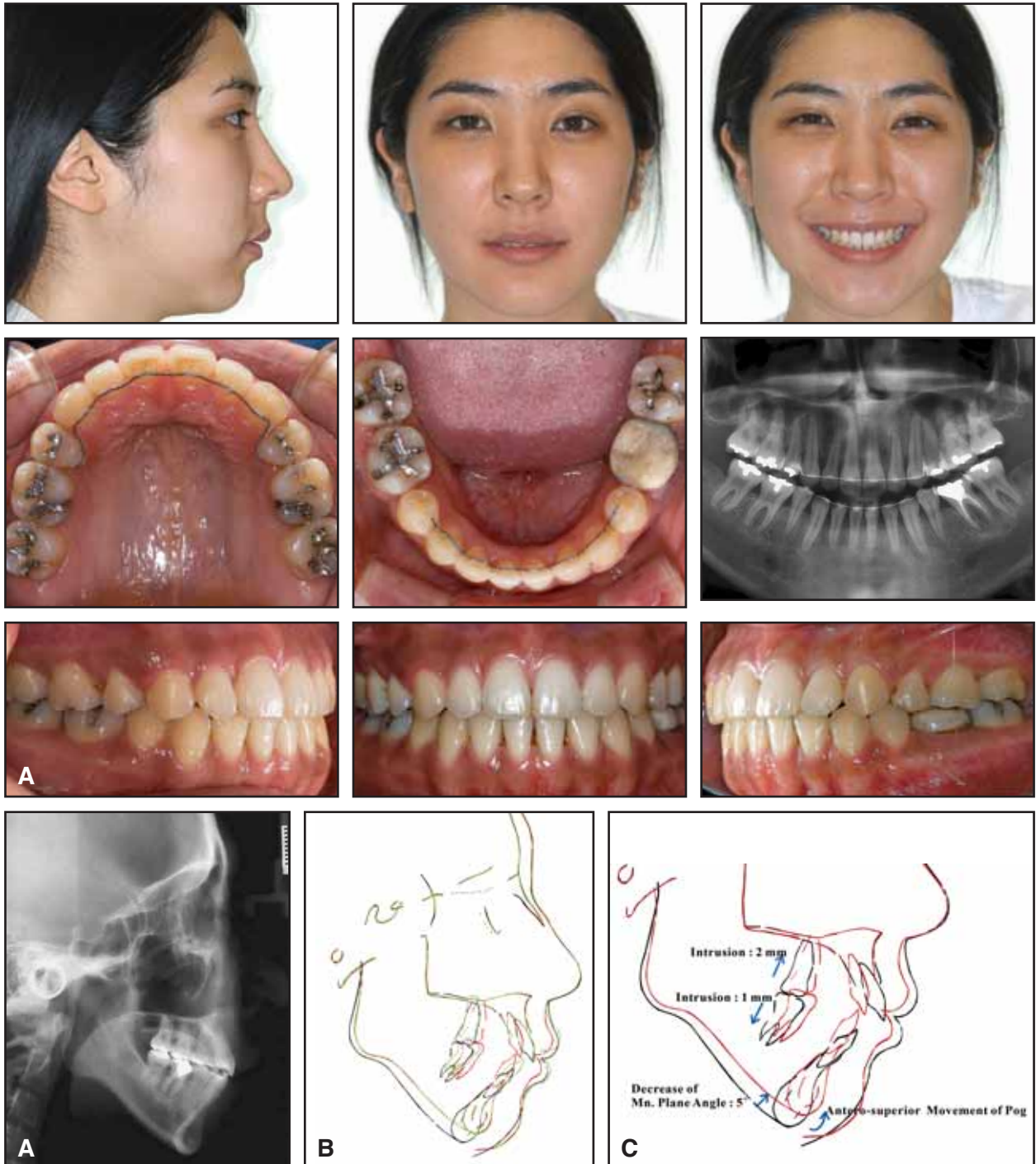


Fig. 5 A. Patient after 21 months of active treatment. B. Superimposition of pretreatment (black), post-intrusion (green), and post-treatment (red) cephalometric tracings. C. Superimposition of pretreatment (black) and post-treatment (red) cephalometric tracings. Note counterclockwise rotation of mandible.

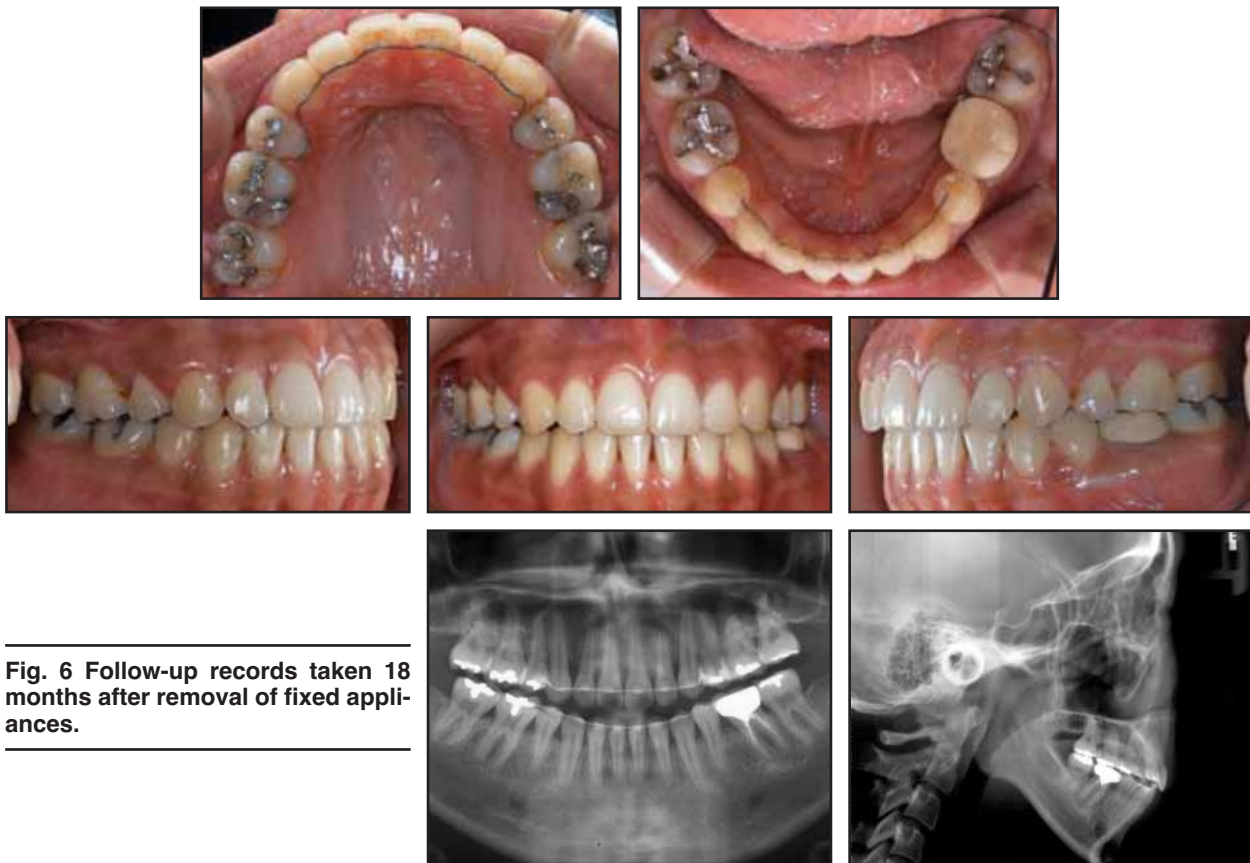


Fig. 6 Follow-up records taken 18 months after removal of fixed appliances.

Conclusion

In the case presented here, orthodontic intrusion of the posterior teeth in both arches, using miniscrew anchorage, achieved a reduction in posterior dentoalveolar height, correction of anterior open bite, counterclockwise rotation of the mandible, and esthetic improvement in the profile, lip contour, and vertical proportions of the lower face. Long-term follow-up is needed to further evaluate the patient’s soft-tissue and muscular adaptation to the counterclockwise rotation of the mandible and to assess the stability of the correction.

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