

Extraction Space Closure with Vacuum-Formed Splints and Miniscrew Anchorage

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Clear, removable appliances have been used for many years to move teeth without brackets or bands.^{1,2} A recently developed version, the Invisalign* system, has been used successfully as an esthetic alternative to fixed appliances for adult patients. In extraction cases, however, bod-

ily tooth movement and anterior torque control are difficult to achieve with this system.^{3,4} The present article introduces an esthetic and efficient method of treating extraction patients with clear vacuum-formed appliances and miniscrew anchorage.

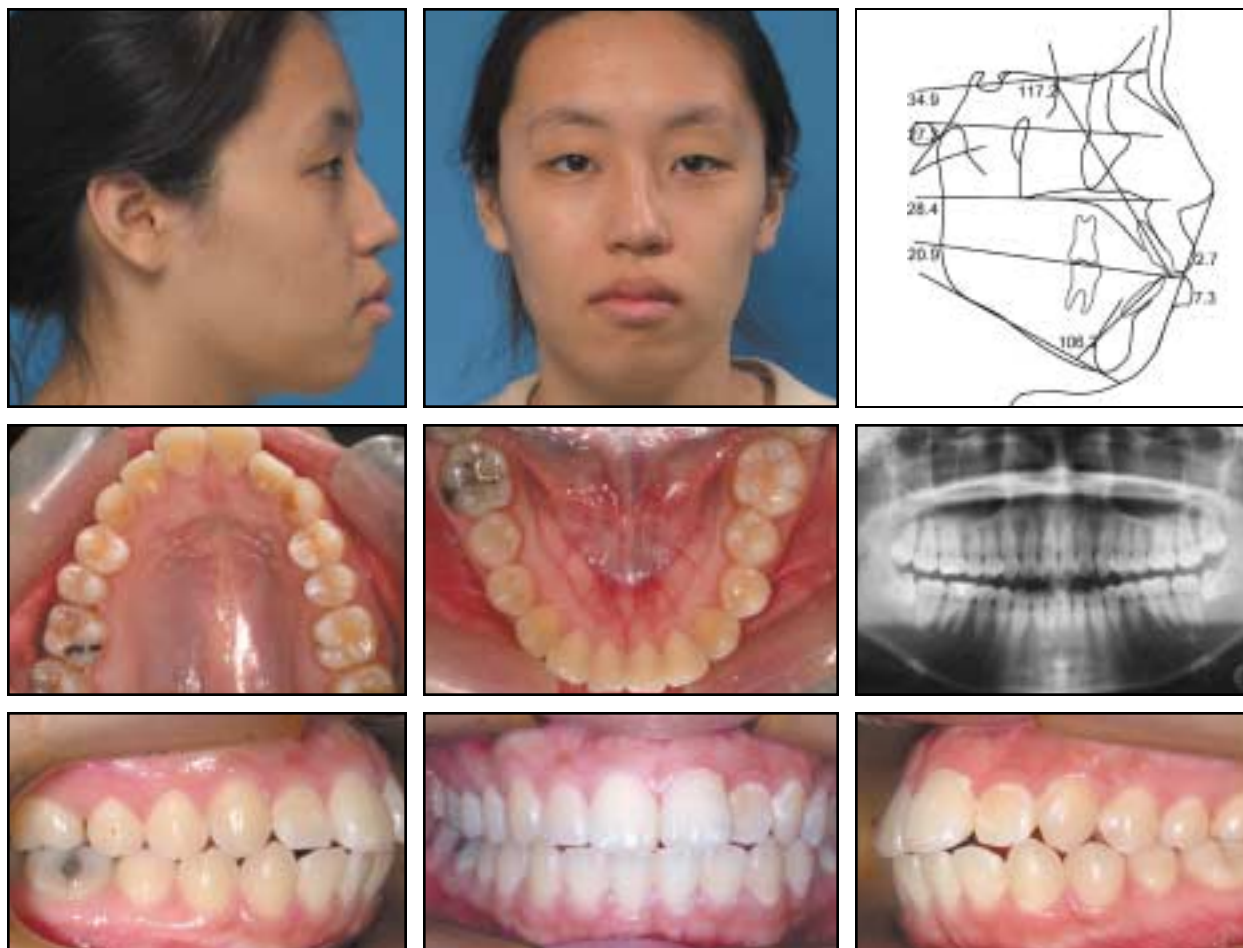


Fig. 1 20-year-old female patient with lip protrusion before treatment.

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The 20-year-old female shown here presented with the chief complaint of lip protrusion (Fig. 1). She had a mild anterior crossbite on the left side, 1mm of maxillary crowding, 1.5mm of overbite, 2mm of overjet, and Class I canine and molar relationships. Her lower dental midline was deviated 1mm to the right. The Wits appraisal and vertical measurements were within the normal range, but the upper and lower anterior teeth showed a severe labioversion, and both lips were protrusive in relationship to the Ricketts E-line (Table 1).

The diagnosis was a skeletal Class I malocclusion with bialveolar protrusion. Extraction of the four first premolars and maximum retraction of the anterior teeth were planned. Because the patient was concerned about her appearance after appliance placement, vacuum-formed splints were used for the initial retraction.

Procedure

Alginate impressions were taken for fabrication of 1mm Duran** hard-elastic acrylic splints. Lever arms made of .036" round stainless steel wire were positioned on both sides of each cast, then held in place with baseplate wax while the splints were vacuum-formed in a Biostar.**

Maxillary skeletal anchorage was obtained by implanting 2mm x 7mm miniscrews*** be-

TABLE 1
CEPHALOMETRIC DATA

	Pre-treatment	Post-treatment
SNA	84.9°	84.7°
SNB	81.9°	80.9°
ANB difference	3.0°	3.8°
Wits appraisal	-1.9	-1.8
1-SN	117.2°	101.0°
IMPA	106.2°	92.5°
SN-GoMe	34.9°	36.6°
Upper lip to Ricketts E-line	2.7mm	-1.1mm
Lower lip to Ricketts E-line	7.3mm	1.5mm

tween the second premolars and first molars. For anterior retraction, 3/16" elastics were attached between the lever arms in the acrylic splints and the miniscrews in the upper arch or the hooks on the lower molar bands (Fig. 2). The patient was instructed to wear the elastics full-time except during meals.

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**Registered trademark of Scheu Dental, Iserlohn, Germany; distributed by Great Lakes Orthodontics, Ltd., P.O. Box 5111, Tonawanda, NY 14151.

***Gebruder Martin GmbH & Co., KG Ludwigstaler Strasse 132, D-78532 Tuttlingen, Germany.



Fig. 2 Anterior retraction from elastics between lever arms embedded in acrylic splints and maxillary miniscrews or mandibular molar band hooks.



Fig. 3 Ceramic brackets placed for root movement after six months of anterior retraction.



Fig. 4 Vacuum-formed appliances used for detailing and retention.

To compensate for the posterior open bite caused by the splints, composite biteplanes were bonded to the lower molars. To prevent undesirable distal movement of the posterior teeth, they were bonded and tied passively as anchor units; the first molars were also banded for cross-arch stabilization with a transpalatal arch and lingual arch.

After six months, the anterior teeth were retracted to the point that only 1-1.5mm of space remained between the canines and second premolars. Ceramic brackets were then bonded in both arches, and .019" × .025" Copper Ni-Ti[†] wires were inserted for axial control and root movement (Fig. 3). Two months later, .018" × .025" stainless steel wires were placed for the remaining space closure. Clear, .75mm vacuum-formed appliances were used for another two months of final detailing in both arches^{5,6} (Fig. 4).

The total treatment time was 14 months, with anterior brackets used for only the last six

months. After treatment, the patient had bilateral Class I molar and canine relationships, 2mm of overbite, 2mm of overjet, and dental midlines coincident with the facial midline (Fig. 5). The upper lip was retracted 3.8mm and the lower lip 5.8mm (Table 1), so that the patient exhibited a significant reduction in lip protrusion and an esthetic improvement in the profile.

Lingual fixed retainers were bonded to the upper and lower anterior teeth, and a new vacuum-formed appliance was used as an upper removable retainer.

Discussion

The appliance shown here was esthetically acceptable to the patient and biomechanically effective, minimizing the time needed for visible brackets. The clinician can control the direction of retraction force by using lever arms embedded in the acrylic splints, and the miniscrews provide skeletal anchorage control.

This method can help overcome the limitations of clear positioners or Invisalign appliances in cases requiring extraction space closure.

[†]Registered trademark of Ormco/"A" Company, 1717 W. Collins Ave., Orange, CA 92867.

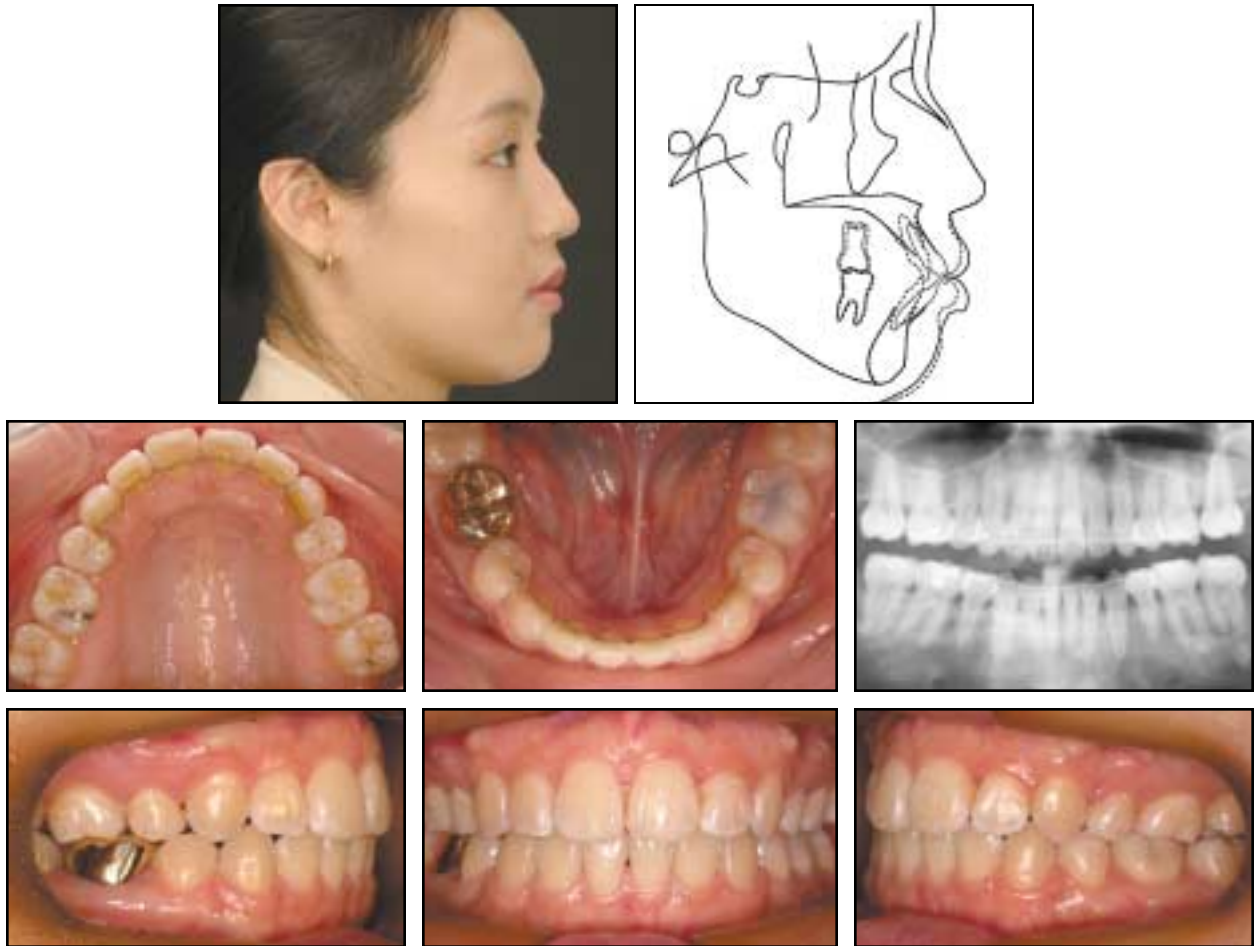


Fig. 5 Patient after 14 months of treatment.

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