En-Masse Distalization with Miniscrew Anchorage in Class II Nonextraction Treatment

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Sagittal movement of the dentition in nonextraction cases is often difficult and time-consuming. The intermaxillary elastics used in Class II or Class III treatment require long-term cooperation, and unwanted side effects such as excessive rotation of the occlusal plane, extrusion of the incisors, and rotation of the mandibular plane can occur.[1]

Miniscrew implants have overcome many of these problems, regardless of whether a single molar or the entire posterior segment is being moved. With skeletal anchorage, side effects are minimized, no special compliance is required, and the incisor positions and facial profile can be efficiently controlled.[2-4]

This article shows how ideal canine and molar relationships and overjet can be produced in Class II treatment through en-masse distalization, using two miniscrews for anchorage.

Case Report

A 19-year-old female presented with the chief complaint of crooked teeth in both arches. She had a balanced and symmetrical face, although her anterior crowding was noticeable in smiling (Fig. 1). Intraoral examination showed a Class II canine and molar relationship, a 5mm overjet, and moderate crowding. Cephalometric analysis revealed a dental Class II malocclusion with an ANB angle of 4.2°, a hyperdivergent facial profile with a mandibular plane angle of 42.1°, and upright upper incisors (Table 1). Slight alveolar bone loss and impacted upper and lower third molars were observed in the panoramic radiographs.

Treatment objectives were to relieve the crowding in both arches, establish a Class I molar and canine relationship, and maintain the facial profile. After various treatment options were discussed with the patient, nonextraction therapy involving retraction of the entire maxillary dentition was selected.

Treatment began with a Hyrax-type expander, activated at a rate of 1mm/week, and .018" Roth-prescription brackets bonded to all the mandibular teeth. After six months of expansion, the arch widths were properly coordinated, and the Hyrax appliance was removed. All maxillary teeth were then bonded with .018" Roth-prescription brackets.

TABLE 1
CEPHALOMETRIC DATA

	Pre-treatment	Post-Treatment
SNA	78.2°	78.2°
SNB	74.0°	73.9°
ANB	4.2°	4.3°
SN-GoMe	42.1°	43.0°
U1-SN	97.2°	98.0°
IMPA	91.5°	92.8°
Wits appraisal	–0.2mm	–1.6mm
UL to E-line	–1.2mm	–1.7mm
LL to E-line	–0.9mm	–0.5mm

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About 13 months into treatment, the crowding had been relieved, but the Class II malocclusion and overjet remained. An .016" × .022" stainless steel archwire with 13° additional labial crown torque in the anterior region and an accentuated curve of Spee was placed in the maxillary arch. Hooks were welded to the archwire on both sides between the canines and first premolars. Two miniscrew implants* (1.8mm in diameter, 7mm long) were placed in the alveolar bone, about 1mm

*Orlus, registered trademark of Ortholution, 207 Dunchon B/D, #416-1, Seongnae-dong, Gangdong-gu, Seoul 134-844, Korea; www.ortholution.com.

Fig. 1 Case 2. 19-year-old female Class II patient with anterior crowding before treatment.

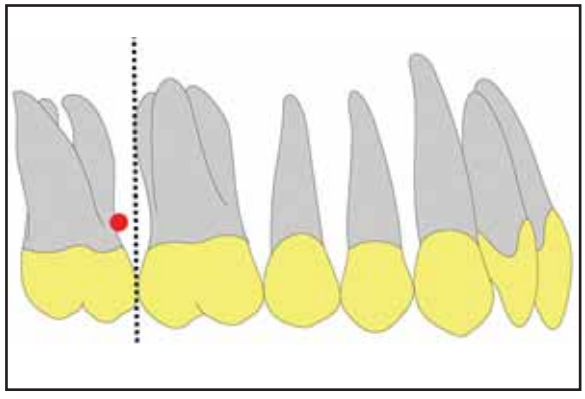

Fig. 2 Miniscrew implant placed about 1mm distal to vertical line from contact point between first and second molars to anchor distal movement of entire maxillary dentition.

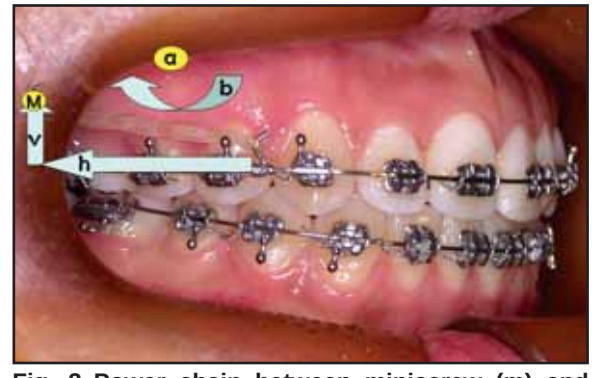

Fig. 3 Power chain between miniscrew (m) and archwire hook produces clockwise moment (b) below center of resistance of maxillary dentition (a), moving entire arch distally (v = vertical force vector; h = horizontal force vector).

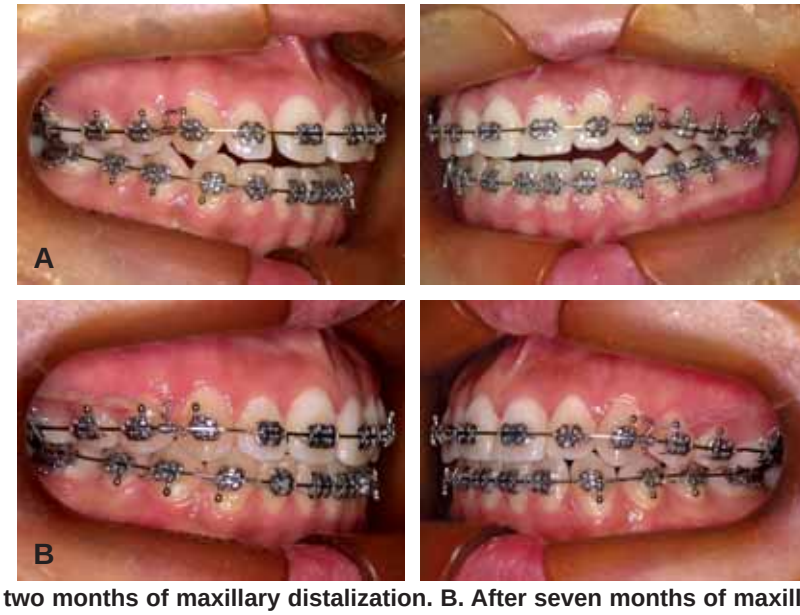

Fig. 4 A. After two months of maxillary distalization. B. After seven months of maxillary distalization.

distal to vertical lines from the contact points between the first and second molars, to anchor distal movement of the entire maxillary dentition (Fig. 2). The hooks were kept short to generate a clockwise moment and thus avoid extrusion of the maxillary posterior teeth (Fig. 3). Power chains** were attached between the hooks and miniscrews, with a retraction force of about 200g on each side.

After seven months of distalization (Fig. 4), a normal overjet and Class I canine and molar relationships had been achieved. The distalizing forces were discontinued, and .016" stainless steel finishing archwires were placed in both arches. Two months later, the appliances were removed (Fig. 5), and fixed and removable retainers were delivered.

**Ormco/"A" Company, 1717 W. Collins Ave., Orange, CA 92867; www.ormco.com.

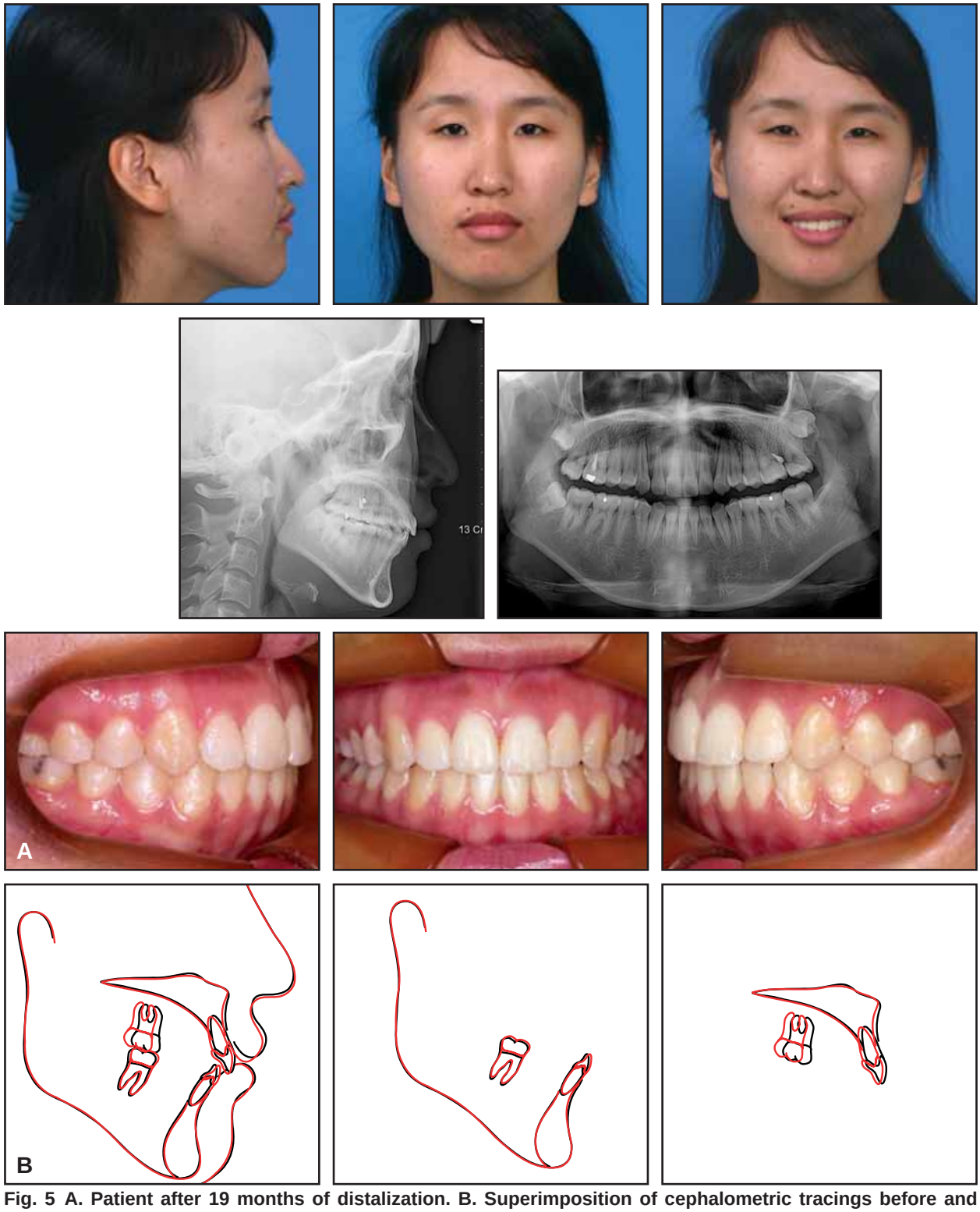

Fig. 5 A. Patient after 19 months of distalization. B. Superimposition of cephalometric tracings before and after distalization.

Discussion

In a case such as this, each miniscrew would ideally be implanted in the attached gingiva, adjacent to or apical to the level of furcation of the first molar, so that the vertical line of force would pass through the center of resistance of the entire maxillary dentition.[5] The more apically the miniscrew is placed, the greater the vertical force vector that will be applied to the posterior teeth. In practice, however, it is difficult to locate the precise position of the center of resistance. Therefore, to avoid producing a counterclockwise moment, the line of force of the power chain should pass slightly below the estimated center of resistance (Fig. 3).

The distance between the molar roots will determine the amount that the maxillary arch can be moved backward or forward.[5-7] More interproximal alveolar bone is available between the maxillary second premolar and first molar roots and between the maxillary first molar and second molar roots than in other locations.[6] Additional space for distal movement can be obtained by angulating the miniscrews 30-40° superiorly to the perpendicular of a plane tangent to the buccal cortical bone.[7]

In our clinical experience, it is better to place the archwire hooks between the canines and first premolars than between the lateral incisors and canines. Not only does this reduce soft-tissue impingement, but it also prevents transverse forces between the hooks and miniscrews from causing unwanted expansion of the posterior dentition. In premolar extraction cases treated with sliding mechanics, the posterior arch is naturally constricted as a result of posterior anchorage loss. In nonextraction cases, where the arch length is longer, the posterior teeth resist constriction during retraction of the entire dentition. A palatal expander may still be needed to compensate for the relative narrowness of the maxillary arch as it is moved backward. No lingual molar tipping, such as that reported by Park,[2] was observed in the present case, which might be due to the initial buccal tipping of the posterior teeth caused by the palatal expander.

After treatment, the maxillary incisors were slightly proclined because of the angulation in the bracket prescription and the 13° labial crown torque in the archwire. A bodily distal incisor movement of about 3mm was evident in the cephalometric superimpositions, however, resulting in a slight retrusion of the upper lip compared to the Ricketts E-line (Table 1). The mandibular plane angle was well maintained.

Minor extrusion of the upper second molars, which is commonly seen after distalization of the posterior teeth,[3,4] occurred in this case despite the vertical force vector and clockwise moment applied to the archwire (Fig. 5). The upper second molars were also tipped back, creating a marginal ridge discrepancy between the first and second molars. To prevent this, the upper second molar tubes should have been bonded more occlusally.

In patients where there is not enough posterior space for distal movement, the third molars should be extracted before orthodontic treatment. In the present case, the distance between the maxillary second and third molars was about 3mm on each side, indicating that retraction of the entire maxillary dentition could be successful without extractions. The patient was informed that her impacted upper third molars would need to be removed at a later date.

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