Various extraoral and intraoral fixed appliances have been used in Class II cases to distalize the upper molars without extractions.1,2 The main disadvantage of these appliances is anchorage loss, which may cause mesial tipping of the anterior teeth unless skeletal anchorage is added.3,4 There is also some controversy regarding the effectiveness of distalizing appliances once the second and third molars have erupted.5,6

This case report describes the use of heat-activated nickel titanium wires for molar distalization, referred to as the Loca-Sys-tem, to correct a Class II malocclusion with skeletal asymmetry.7

Diagnosis and Treatment Planning

A 17-year-old female presented with the chief complaints of overlapping anterior teeth and crowding. She displayed a severe mandibular skeletal asymmetry; a Class II, division 1 malocclusion; maxillary crowding; excessive overjet and overbite; and a mandibular midline shift of 2mm to the left (Fig. 1). Cephalometric analysis indicated retrognathia of the maxilla and mandible, flaring of the upper incisors, a normal inclination of the lower incisors, and a normal vertical facial pattern (Table 1).
Correction of Bilateral Class II Malocclusion

Fig. 1 17-year-old female patient with mandibular skeletal asymmetry; Class II, division 1 malocclusion; deep bite; and excessive overjet before treatment.
Three treatment options were proposed. The first was a combined surgical-orthodontic approach involving extraction of the upper first premolars, with the aim of correcting the mandibular asymmetry, maxillomandibular retrusion, and crowding. The second option also proposed extraction of the upper first premolars, followed by orthodontic correction of the maxillary crowding, overjet, and overbite. The third option consisted of extraction of the upper third molars and distalization of the upper first molars with heat-activated nickel titanium wires to achieve a dental Class I relationship, alleviate the crowding, and normalize the overjet and overbite.²

Since the patient’s complaints were only the crowding and overlapping of her anterior teeth, and because she did not want to have the first premolars extracted, she chose the third treatment option.

### TABLE 1
CEPHALOMETRIC ANALYSIS

<table>
<thead>
<tr>
<th></th>
<th>Norm</th>
<th>Pretreatment</th>
<th>Post-Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNA</td>
<td>82.0°</td>
<td>77.2°</td>
<td>77.4°</td>
</tr>
<tr>
<td>SN-Pg</td>
<td>80.0°</td>
<td>73.6°</td>
<td>76.2°</td>
</tr>
<tr>
<td>AN-Pg</td>
<td>2.0°</td>
<td>3.6°</td>
<td>1.2°</td>
</tr>
<tr>
<td>Maxilla-Cranial base</td>
<td>8.0°</td>
<td>8.7°</td>
<td>10.5°</td>
</tr>
<tr>
<td>Mandible-Cranial base</td>
<td>33.0°</td>
<td>35.4°</td>
<td>36.3°</td>
</tr>
<tr>
<td>Maxillomandibular angle</td>
<td>25.0°</td>
<td>26.7°</td>
<td>25.9°</td>
</tr>
<tr>
<td>U1-Maxillary plane</td>
<td>110.0°</td>
<td>116.0°</td>
<td>102.0°</td>
</tr>
<tr>
<td>L1-Mandibular plane</td>
<td>94.0°</td>
<td>96.0°</td>
<td>99.0°</td>
</tr>
<tr>
<td>Compensation of L1</td>
<td>2.0mm</td>
<td>−0.7mm</td>
<td>1.2mm</td>
</tr>
<tr>
<td>Overbite</td>
<td>3.5mm</td>
<td>5.6mm</td>
<td>3.5mm</td>
</tr>
<tr>
<td>Overjet</td>
<td>2.0mm</td>
<td>7.5mm</td>
<td>1.1mm</td>
</tr>
<tr>
<td>U1-L1</td>
<td>132.0°</td>
<td>124.4°</td>
<td>135.8°</td>
</tr>
</tbody>
</table>

The biomechanics used in this treatment involve an .018" × .025" Neo-Sentalloy® superelastic nickel titanium archwire deflected between the first premolar and first molar by the length of the molar tube, about 6mm (Fig. 2). As the wire straightens, it applies a force to both sides of the arch. If the upper second mo-

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Fig. 2 Biomechanics: .018" × .025" superelastic nickel titanium archwire deflected between first premolar and first molar by length of molar tube (about 6mm); Class II elastics worn from upper first premolar to lower first molar to prevent protrusion of maxillary anterior teeth; lip bumper used to control mesialization of lower arch.
Correction of Bilateral Class II Malocclusion

...lars are fully erupted, a 200g archwire is advised; if not, a 100g archwire can be used. Class II elastics applying 180g of force are attached from upper first premolar to lower first molar to prevent protrusion of the maxillary anterior teeth; a lip bumper is used to control mesialization of the lower arch.7

Full-arch Bidimensional fixed appliances were bonded, using .018" × .025" brackets for the incisors and .022" × .028" brackets for the canines and posterior teeth. Initial leveling and alignment were carried out on .014" and .016" × .016" nickel titanium archwires. In the meantime, the upper third molars were extracted. After three months of treatment, a 200g, .018" × .025" Neo-Sentalloy heat-activated nickel titanium wire was inserted in the upper arch to finalize leveling, and an .018" × .022" stainless steel archwire with lacebacks was applied in the lower arch (Fig. 3).

To distalize the upper molars, crimpable stops were added distal to the first premolar brackets and to the upper first-molar tubes. A superelastic nickel titanium archwire was then inserted, with the stops mesial to the first-molar tubes, creating a curve and leaving the upper second premolars disengaged (Fig. 4). Kobayashi ligatures were used on the upper first premolars for attachment of 180g...
Class II elastics, which were worn from the upper first premolars to lower first molars to prevent protrusion of the maxillary anterior teeth. A lip bumper was inserted in the lower first-molar tubes to prevent undesirable mesial movement of the lower arch.

The upper molars were distalized for six months, until a super-Class I molar relationship was achieved (Fig. 5). The upper second premolars followed spontaneously by means of the pull of the transseptal fibers. Some anchorage loss occurred in the maxillary anterior segment, as evidenced by bite opening.

To prevent relapse of the distalization, realign the upper second premolars, and begin distalization of the upper premolars, another 200g, .018” × .025” heat-activated nickel titanium archwire was inserted with crimpable stops mesial to the upper first molars. An open-coil spring was initially placed between the premolars. Four weeks later, once the second premolars were distalized, the spring was moved between the first premolars and canines. Class II elastics were continued for anchorage.

Realignment occurred in nine weeks. At that point, an .018” × .022” stainless steel archwire was inserted in the upper arch, and the canines and upper incisors were retracted with elastic chain, again using Class II elastics for anchorage. Distalization of the upper premolars, canines, and incisors took 10 months. After a Class I dental relationship was obtained, a small space was left between the upper left canine and premolar to coordinate the maxillary and mandibular midlines. Total treatment time was 29 months.

Treatment Results

Post-treatment records demonstrated an improvement in facial esthetics from the frontal and lateral perspectives, with a harmonious soft-tissue profile (Fig. 6A). Maxillary and mandibular midline coordination and overjet reduction improved the smile esthetics, although the patient’s skeletal asymmetry remained. The maxillary and mandibular dental arches were well aligned, Class I molar and canine relationships were achieved, and the overbite and overjet were normalized. Cephalometric superimpositions showed that the upper arch was distalized, the lower arch was mesialized, and the upper-incisor inclination was normalized, while the lower-incisor inclination was slightly increased (Fig. 6B).
Fig. 6 A. Patient after 29 months of treatment (continued on next page).
Discussion

Distalization with heat-activated nickel titanium archwires proved to be a simple, effective, and noninvasive biomechanical system for achieving a Class I dental relationship in this Class II patient with skeletal asymmetry, although her cooperation was required. Temporary anchorage loss and bite opening occurred, and the prolonged use of Class II elastics caused a mesialization of the lower arch, despite the use of a lip bumper. The application of miniscrews for indirect skeletal anchorage of the upper first premolars may be an effective solution to these problems.

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REFERENCES