

# Molar Distalization with a Miniscrew-Anchored Sliding Jig

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The sliding jig, used to transmit distalizing forces from intermaxillary elastics to the molars,<sup>1</sup> has the disadvantages of requiring patient compliance and of potentially losing anchorage due to reactive forces.<sup>2</sup> To overcome these problems, we use a miniscrew-anchored sliding jig with forces applied by elastomeric chain (Fig. 1). As described in the present article, the jig can be used for bilateral or unilateral distalization in the upper or lower arch.

## Appliance Design

The sliding jig is fabricated from .017" × .025" stainless steel wire. To avoid soft-tissue irritation and to facilitate the attachment of elastomeric chain, the mesial end of the wire is doubled



Fig. 1 Miniscrew-anchored sliding-jig system.

back, and the doubled wire bent in slightly toward the gingivae. Vertical legs are positioned so that the welded sliding hooks\* will lie at the distal margin of the canine bracket and the mesial margin of the first molar tube when the appliance is placed on the archwire.

In most situations, miniscrews are inserted buccally between the second premolars and first molars, although other sites may be appropriate. After the sliding jig has been finished and polished, it is placed over the main archwire and activated with elastomeric chain from the jig's mesial hook to the miniscrew.

## Case 1

A 22-year-old female patient presented with the chief complaint of anterior crowding (Fig. 2). Examination revealed a mild skeletal Class III tendency, excessive overjet, Class II canine and molar relationships, and hyperactivity of the mentalis muscle. There was 6mm of crowding in the upper arch and 4mm in the lower. Because the lip profile was acceptable, premolar extraction was not considered an attractive treatment option. Instead, anterior interproximal reduction and upper full-arch distalization were planned, involving extraction of the upper second molars rather than the upper third molars to enable more effective distal movement.

Two months after extraction of the upper second molars, miniscrews were inserted bilaterally between the upper second premolars and first molars. After .022" brackets were bonded to all teeth except the rotated upper central incisors, an

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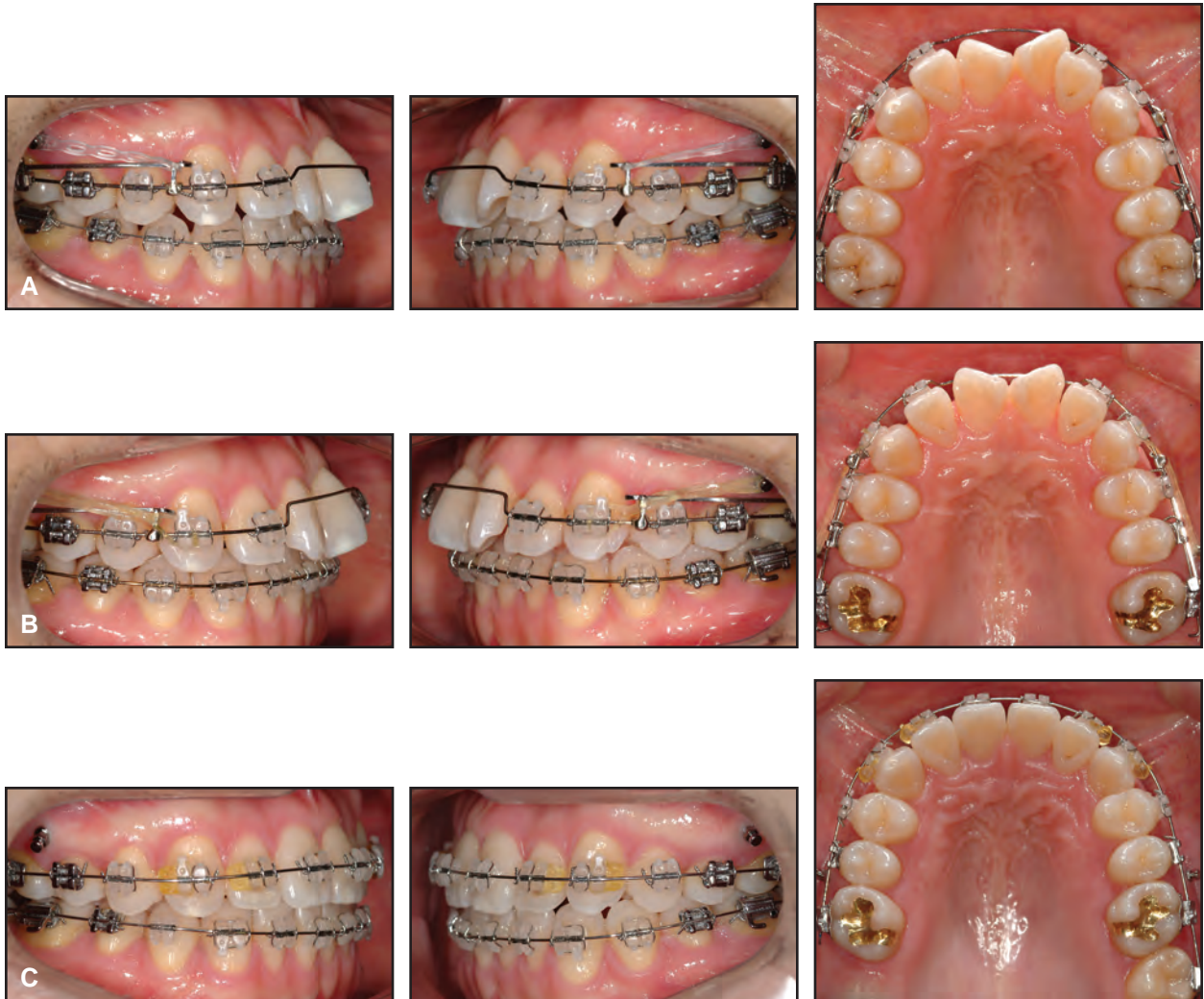
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**Fig. 2 Case 1. 22-year-old female patient with anterior crowding and Class II molar relationship before treatment.**



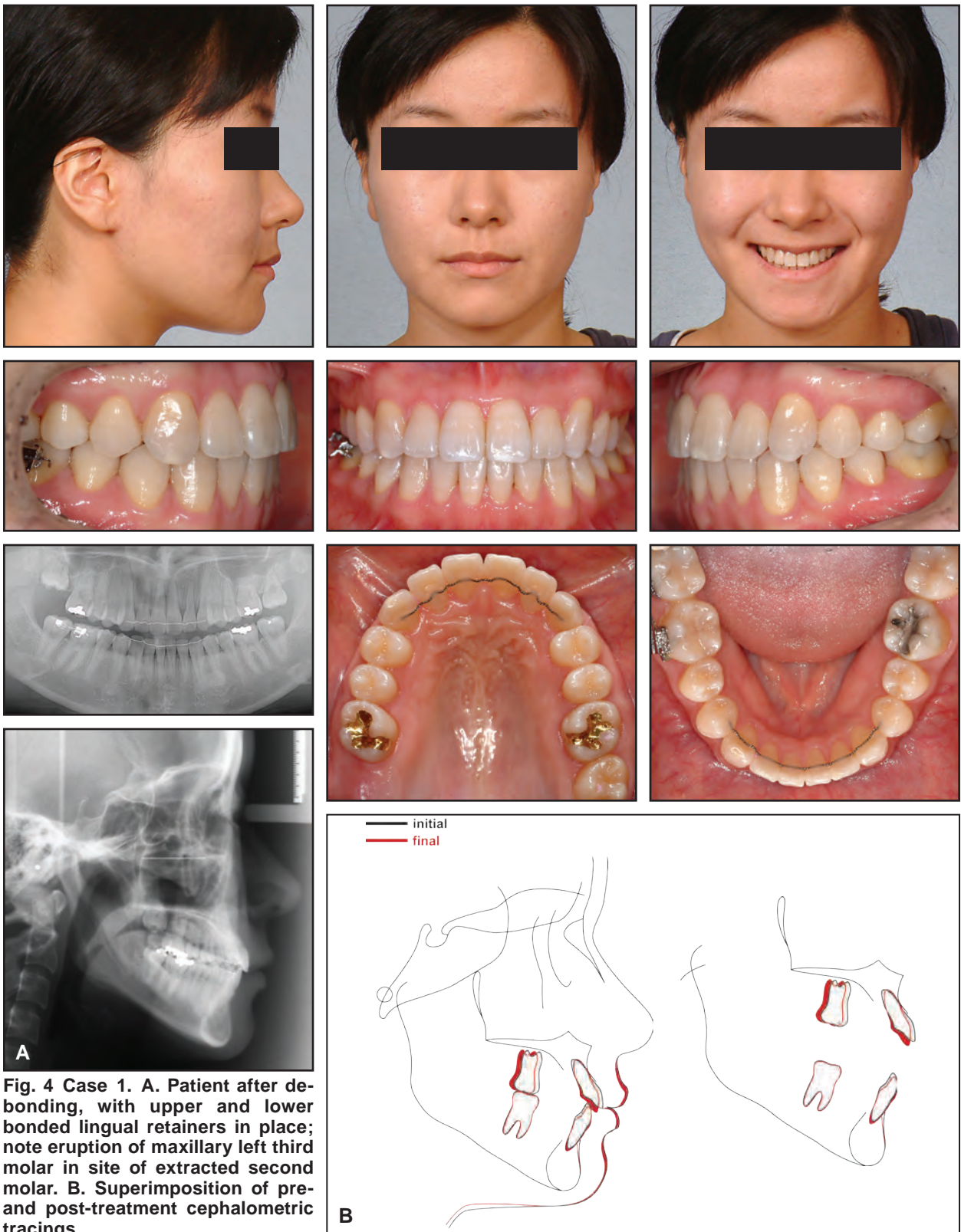
**Fig. 3 Case 1. A. Upper molar distalization initiated after four months. B. Generalized spacing observed after eight months. C. Anterior crowding relieved and spaces closed after 16 months.**

upper .016" stainless steel archwire was placed, and distalizing forces were initiated with sliding jigs and elastomeric chain (Fig. 3A). After eight months, distal tooth movement had produced generalized spacing (Fig. 3B), which was used for alignment of the upper anterior teeth. The upper left third molar erupted naturally in an appropriate position (Fig. 3C).

Total treatment time was 18 months (Fig. 4A). Post-treatment records showed an improved

smile line, a slightly retrusive lip profile, reduced mentalis activity, and Class I canine and molar relationships. Cephalometric superimpositions indicated about 2mm of distal upper-molar movement and controlled tipping of the upper incisors (Fig. 4B).

Follow-up records taken 18 months after debonding confirmed the stability of the upper full-arch movement and the proper eruption of the upper right third molar (Fig. 5).



**Fig. 4 Case 1. A.** Patient after debonding, with upper and lower bonded lingual retainers in place; note eruption of maxillary left third molar in site of extracted second molar. **B.** Superimposition of pre- and post-treatment cephalometric tracings.



**Fig. 5 Case 1. Generally stable results 18 months after debonding.**

### Case 2

A 24-year-old female presented with the chief complaint of a protrusive mandible (Fig. 6). A skeletal Class III tendency was observed, along with facial asymmetry, lower lip protrusion, lip incompetency, an upper central diastema, a shallow overjet and overbite, and a steep occlusal plane. The Class III relationship on the left side had caused the dental midline to shift.

The patient refused orthognathic surgery, leaving the options of full-arch distalization or single-lower-incisor extraction to correct the Class III occlusion. Since there was sufficient room between the distal surface of the lower left second molar and the ascending ramus for the required 3-4mm of distalization in that quadrant, a non-extraction treatment plan was chosen.

After initial leveling, distal movement in the lower arch was initiated on an .016" × .022" stainless steel archwire. Because a significant amount of distal movement was needed in the lower left quadrant, a sliding jig was placed, and forces were applied with an elastomeric chain from a miniscrew in the retromolar area (Fig. 7). In the lower right quadrant, a miniscrew was placed buccally between the second premolar and first molar, with

elastomeric chain connected directly to a canine retraction hook.

After 12 months of treatment, the overjet and overbite had increased. Unilateral distal movement of the upper arch was then initiated for midline correction, applying force for two months from an elastomeric chain anchored to a lingual miniscrew on the right side (Fig. 8A). After final detailing (Fig. 8B), all brackets were debonded; overall treatment time was 20 months.

Post-treatment records showed an improvement in lip posture and the smile line and a stable occlusion, with Class I canine and molar relationships (Fig. 9A). Cephalometric superimpositions demonstrated that the lower molars had moved distally about 4.5mm at the crown level and 3mm at the root apex level (Fig. 9B). Controlled tipping of the upper incisors contributed to a consonant smile line.

Follow-up records taken 16 months after appliance removal showed that the overbite had decreased slightly since debonding, but that the overall treatment result had been maintained (Fig. 10). Although the adequate overjet indicates that this patient's treatment will remain stable, long-term observation will be recommended.

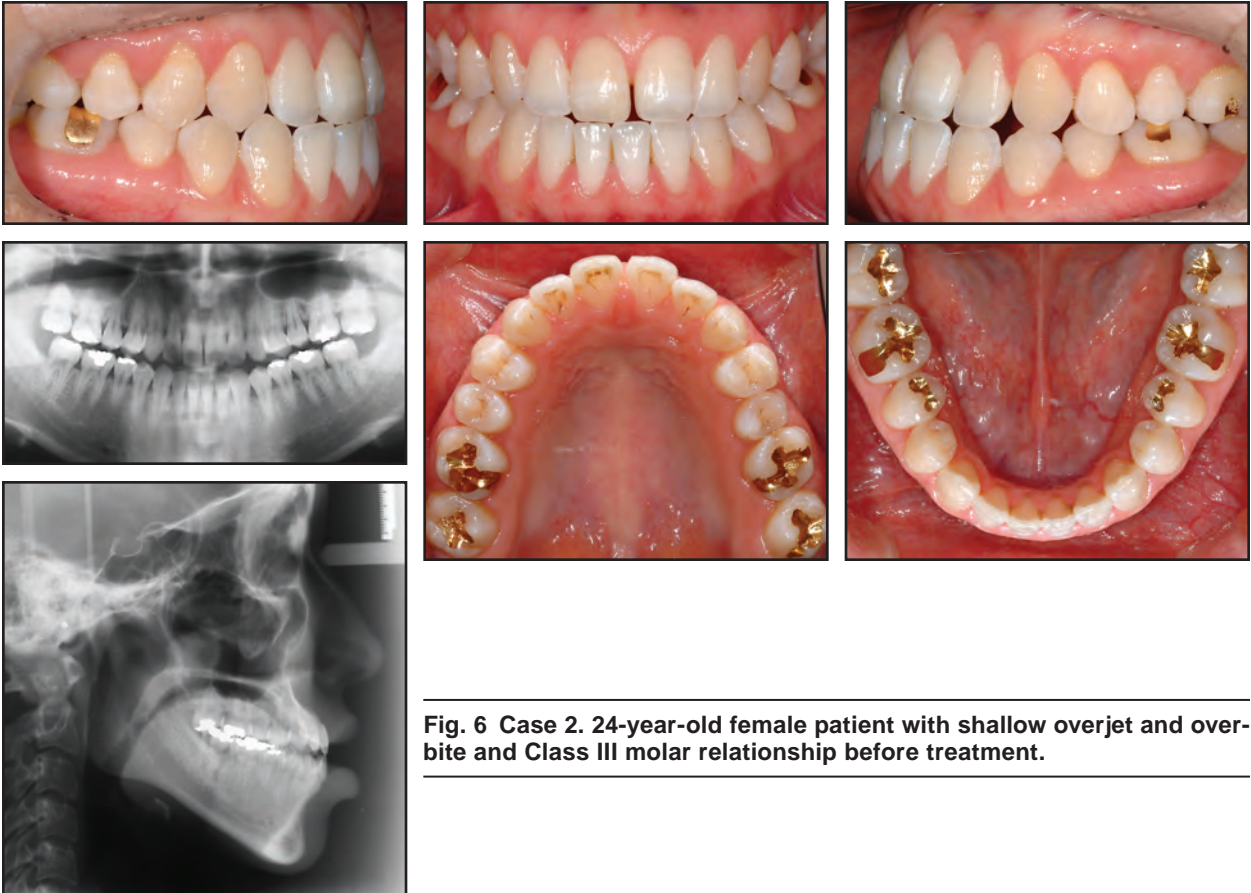


Fig. 6 Case 2. 24-year-old female patient with shallow overjet and overbite and Class III molar relationship before treatment.

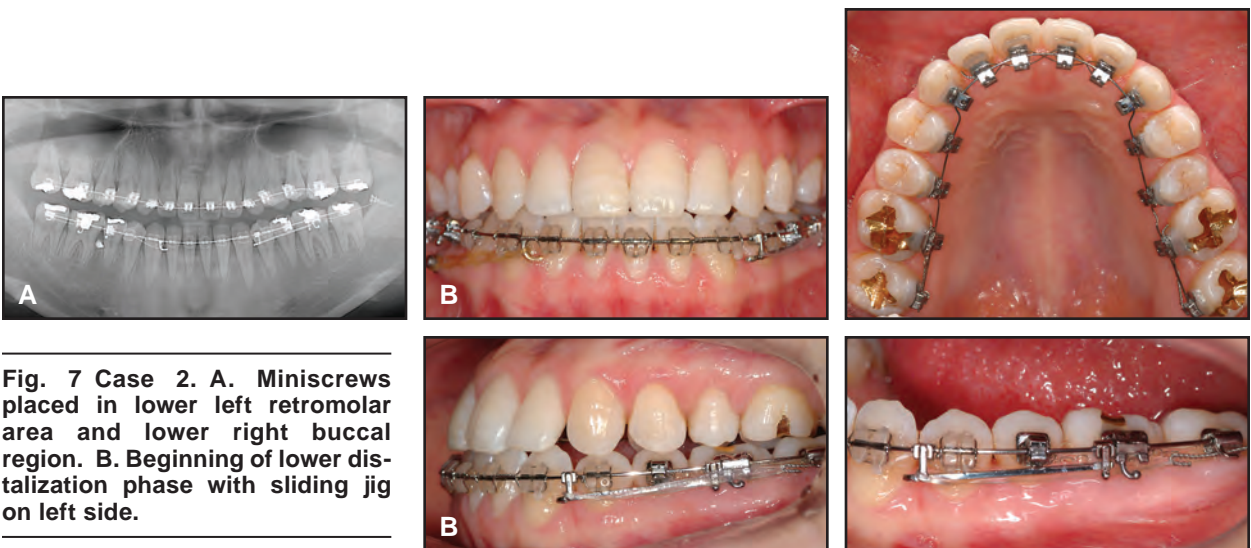


Fig. 7 Case 2. A. Miniscrews placed in lower left retromolar area and lower right buccal region. B. Beginning of lower distalization phase with sliding jig on left side.



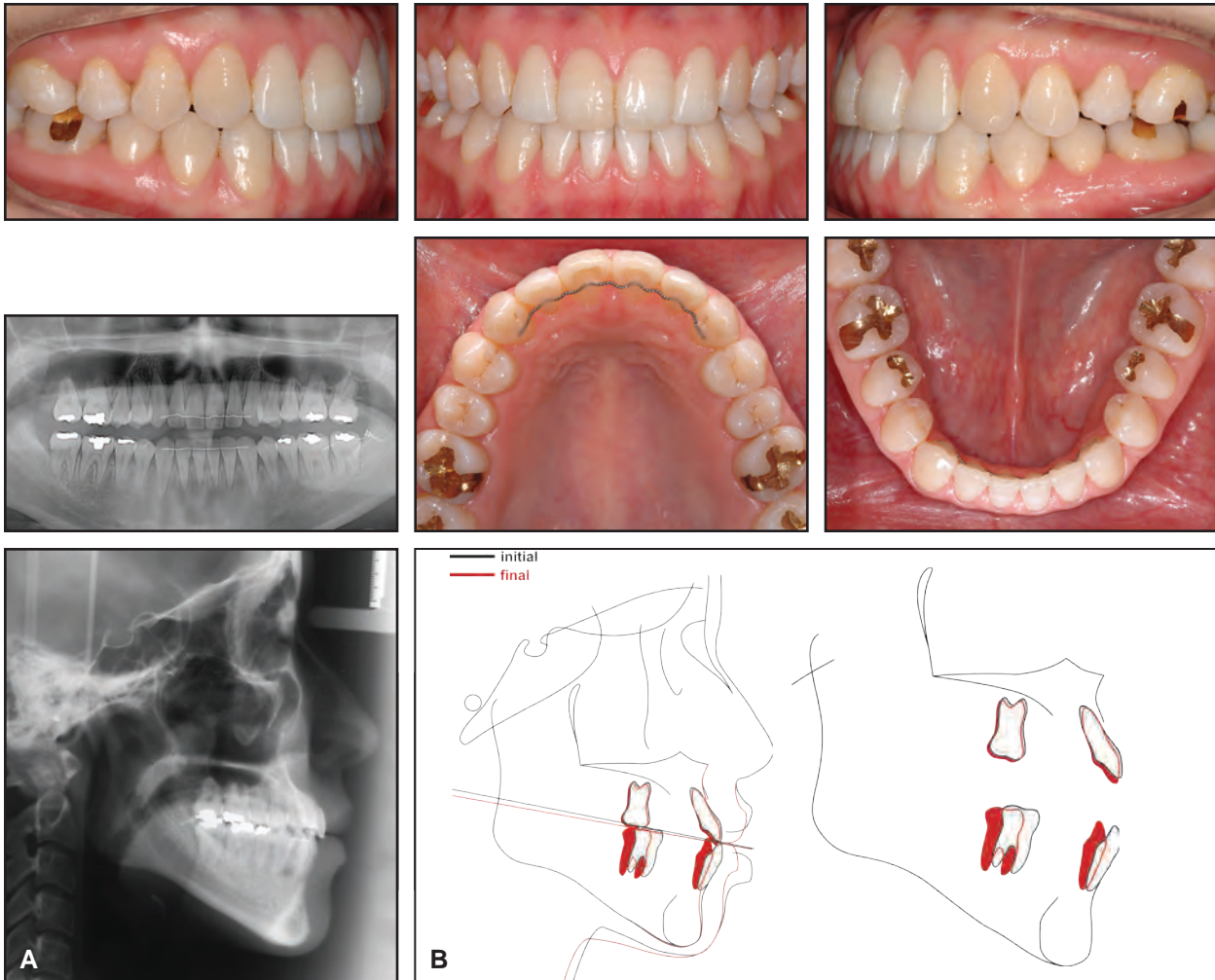
**Fig. 8 Case 2. A.** Miniscrew placed in upper right lingual alveolar region after 12 months of treatment; note change in dental midline. **B.** Overcorrected overjet and molar relationship exhibited during finishing stage.

## Discussion

The miniscrew-anchored sliding jig combines the benefits of skeletal anchorage and a simply designed and versatile distalizing appliance. Compared to traditional methods and to other miniscrew-anchored distalization techniques,<sup>3-10</sup> it offers several advantages (some of which are shared with the conventional sliding jig):

- More rapid distal movement is possible because forces are applied directly to the teeth rather than to the archwire.
- Retraction can be started in the posterior regions while leaving crowded anterior regions to be aligned later in treatment, as shown in Case 1, avoiding unnecessary roundtripping. In other miniscrew-supported retraction methods, leveling and alignment are generally required before initiating retraction forces.
- The system can be used in either arch, bilaterally or unilaterally.

- In cases requiring unilateral distalization, a sliding jig can prevent archwire distortion caused by direct forces from a miniscrew.
- Because the jig applies a distalizing force directly to the first molar, there is less likelihood that the roots of a second premolar will contact a miniscrew. When the planned distal movement is greater than 2mm, however, relocation of the miniscrew will allow additional distal movement. Retromolar placement of the miniscrew is also an option, as seen in Case 2—although it should be noted that in this patient, the lower dentition was rotated counterclockwise because a retromolar miniscrew lies occlusal to the mandibular dentition's center of resistance. Other effects of miniscrew placement in this region may include deepening of the anterior bite, molar tipback, and flattening of the occlusal plane. Although our patient's lower left second molar exhibited a tipback tendency, overall root parallelism was acceptable at the end of treatment.



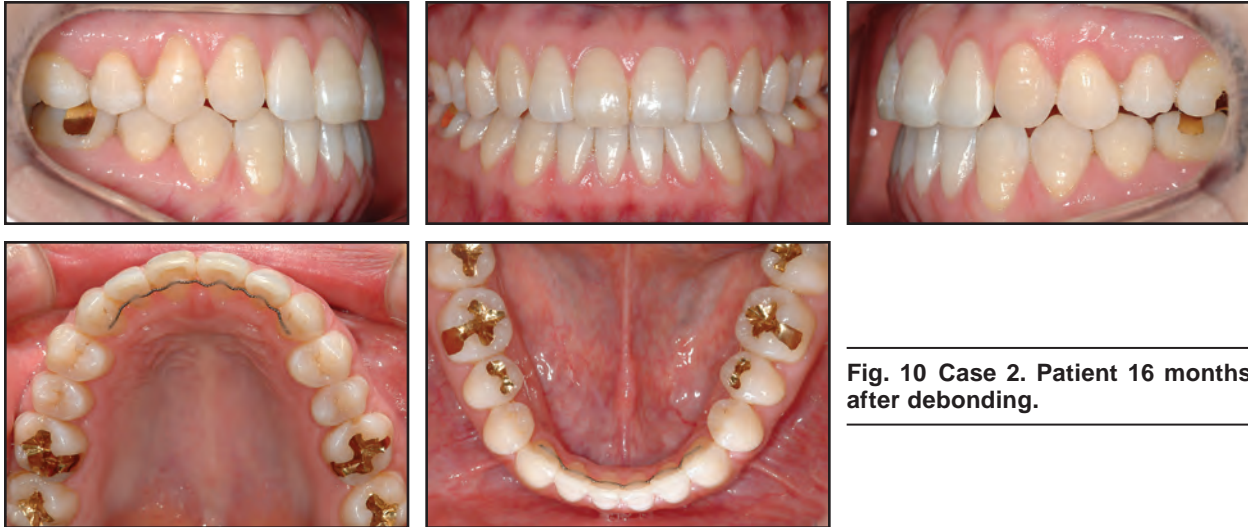
**Fig. 9 Case 2. A. Patient after debonding, with upper and lower bonded lingual retainers in place (miniscrew in left retromolar region was removed one month later). B. Superimposition of pre- and post-treatment cephalometric tracings.**

Compared to a conventional sliding jig that relies on intermaxillary elastics, the miniscrew-anchored sliding jig has the following advantages:

- Patient compliance is not essential for successful treatment.
  - Molars can be moved distally without a reactive force in the opposite arch.
  - Miniscrews can be inserted at various positions, depending on the case.
  - Biomechanical side effects are less deleterious.
- A conventional sliding jig can extrude the canine

region and its opposing molar region when intermaxillary elastics are used, causing a rotation of the occlusal plane (Fig. 11). On the other hand, the miniscrew-sliding-jig system has an intrusive and expansive effect that generally results in an increase in intercanine width (Fig. 12). If necessary, this effect can be minimized by using a large, rigid, continuous main archwire and by slightly reducing the intercanine width of the main archwire before engagement. In addition, interarch elastics may be used to counteract the intrusive forces.





**Fig. 10 Case 2. Patient 16 months after debonding.**

We usually recommend an .018" round bypass wire as the base wire in cases of minor crowding. For more demanding cases, a rigid, continuous wire with minimum dimensions of .016" × .022" or, optimally, an .017" × .025" rectangular stainless steel wire is advised for .022" brackets.

## Conclusion

The miniscrew-anchored sliding jig has proven to be a simple and versatile method for full-arch distalization in either arch and is especially useful in cases where premolar extractions are undesirable.

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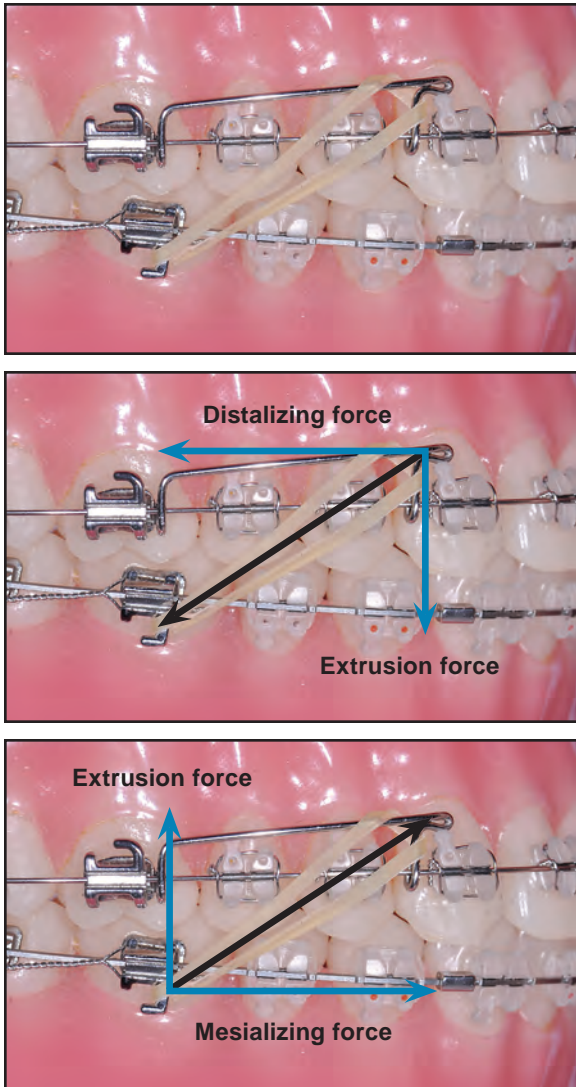


Fig. 11 Design and force diagram of conventional sliding jig. Intermaxillary elastic forces can result in extrusion of canine region and opposing molar region.

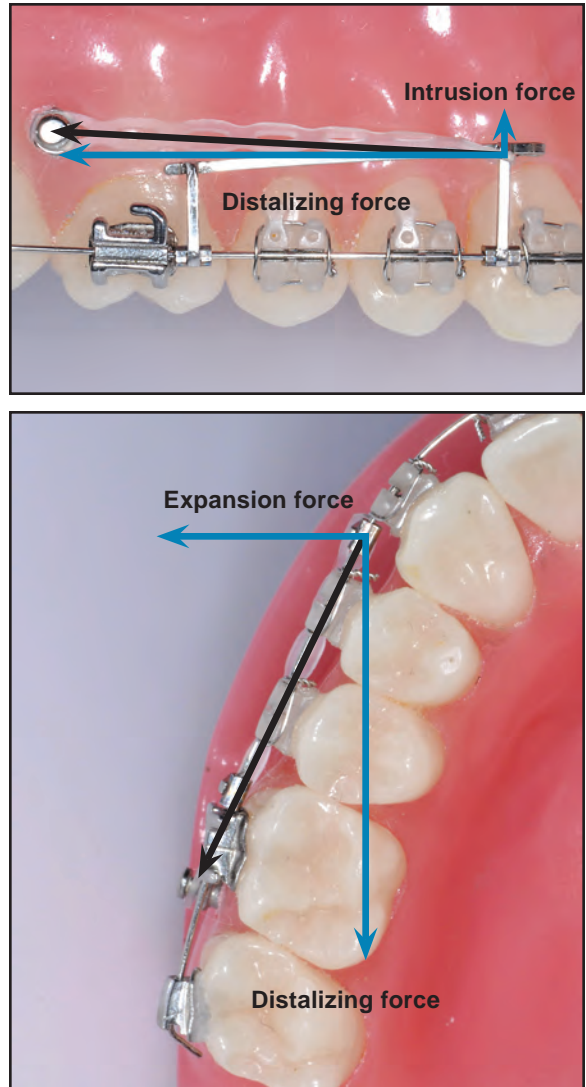


Fig. 12 Force diagram of miniscrew-anchored sliding jig. Canine region may undergo expansion or intrusion, requiring more rigorous anchorage or offsetting forces.