

Class III Nonextraction Treatment with Miniscrew Anchorage

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Since Creekmore and Eklund first recognized the potential of skeletal anchorage in 1983,¹ many authors have documented successful results using various types of skeletal anchorage devices in different locations.²⁻²⁷ In recent years, these applications in orthodontics have become even more refined,^{28,29} and skeletal anchorage has become common in clinical practice.³⁰

Roberts and colleagues were the first to place osseointegrated implants in the retromolar area of the mandible, but their anchors were used to retract only the molars.³¹ This article demonstrates the effectiveness of retromolar miniscrew anchors used for differential retraction of the entire lower dentition in Class III nonextraction treatment.

Case Report

A 16-year-old female presented with a protrusive mandible and a midline shift to the right (Fig. 1). The lower third of her face was slightly

asymmetrical from the front, and her profile was slightly concave. Intraoral examination revealed a symmetrical, V-shaped upper arch and an asymmetrical, U-shaped lower arch, with the right half of the lower dentition shorter and more crowded than the left half. The patient had a Class III molar relationship, a 3mm dental midline discrepancy, an edge-to-edge incisor relationship, inadequate interdigitation in the left premolar region, a crossbite from the right lateral incisor to second premolar, and minor crowding in both incisor regions.

Cephalometric analysis showed a skeletal Class III pattern, with an ANB angle of -2.2° due to the protrusive mandible (SNB $+2$ S.D., Table 1). Dental compensation was evident in the proclination of the upper anterior teeth (FH-U1 $+1$ S.D.) and lingual inclination of the lower anterior teeth (IMPA -1 S.D.). The postero-anterior cephalogram confirmed a 1mm deviation of the maxillary dental midline and a 4mm deviation of the mandibular dental midline to the right of the facial midline, along with a 5mm deviation of the skeletal chin to the right.

The patient appeared to be a borderline surgical-orthodontic case. The conventional treatment would have been to combine mandibular setback surgery with upper first premolar extractions. When the patient and her parents refused surgery, however, we opted for a compromise nonextraction treatment. The required amount of mandibular retraction—6mm on the left side and 2mm on the right—seemed too great for conventional anchorage reinforcement methods, such as incorporating more teeth into the anchor segment; using a lingual arch, Nance holding arch, or transpalatal arch; or adding extraoral or intermaxillary traction. Therefore, skeletal anchorage with retromolar miniscrews, which we regarded as reliable and easy to handle, was chosen.

After five months of leveling and alignment with nickel titanium archwires (.012", .016", .016"

TABLE 1
CEPHALOMETRIC ANALYSIS

	Pre-treatment	Post-Treatment	Norm
SNA	81.9°	83.1°	81.6 ± 3.2°
SNB	84.1°	84.6°	79.2 ± 3°
ANB	-2.2°	-1.5°	2.5 ± 1.8°
FMA	27.0°	29.1°	24.3 ± 4.6°
PFH/AFH	64%	66%	66.8 ± 4.3%
FH-OP	10.6°	7.4°	8.8 ± 3.3°
FH-U1	117.9°	120.9°	116.0 ± 5.8°
IMPA	84.8°	78.0°	95.9 ± 6.4°
UL to E-line	1mm	3mm	-.9 ± 2.2mm
LL to E-line	4mm	3mm	.6 ± 2.3mm
Wits appraisal	-10.5mm	-8mm	-2.7 ± 2.4mm

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Fig. 1 16-year-old female patient with protrusive mandible and midline deviation before treatment.



Fig. 2 Retraction of entire lower dentition from retromolar miniscrews, using closed-pull method on left side and open-pull method on right.

× .022", .019" × .025") on an .022" × .028" preadjusted appliance, the patient was referred to an oral surgeon for implantation of miniscrews (1.6mm in diameter, 6mm long) in the mandibular retromolar pads on both sides (Fig. 2). Because the free gingiva of the right retromolar pad was fairly thin, the head of the miniscrew was left exposed in the oral cavity (open-pull method). In the left retromolar area, which had thicker soft tissue, the miniscrew was entirely embedded (closed-pull method).

Elastic hooks were welded to the .019" × .025" stainless steel archwire between the lower canines and lateral incisors. After the lower first and second molars were tied to the miniscrews with stainless steel ligature wires, power chain was attached from the first molars to the archwire hooks. After a week of soft-tissue healing, retraction of the left half of the lower dentition was begun. Retraction of the right half was delayed by one month because of the lesser amount of movement needed. The retraction of both sides was terminated seven months after the initial activation, and the fixed appliances were debonded four months later.

Despite the underlying Class III skeletal relationship and mandibular asymmetry, the patient attained a Class I dental relationship with normal overjet and overbite and coincident midlines after 16 months of treatment (Fig. 3). Her profile remained virtually unchanged, except for a slight forward movement of the upper lip. The upper incisor proclination increased by a few degrees, lengthening the maxillary arch (Table 1). The

lower first molars were distalized by an average of 4mm, and the lingual inclination of the incisors was increased by 6.8°, but there was a considerable elongation of the anterior portion of the mandibular arch. The patient also seemed to have experienced some late growth in the condylar areas.

The distal movement of the entire lower dentition was confirmed by measurements of the study casts, which showed 6mm of retraction on the left side and 2mm on the right. Analysis of the pre- and post-treatment postero-anterior cephalograms showed that the dental midline coincidence was achieved by a 1mm rightward movement of the upper dental midline and a 2mm leftward movement of the lower, while the midline of the chin remained in about the same position.

Discussion

Although this orthodontic treatment involved compromise, it achieved a normal Class I occlusion and coincident midlines, without premolar extractions, in only 16 months. The bilateral miniscrews served as firm and reliable anchors, allowing en masse retraction that worked like pulling on a pair of reins.

In our clinical experience, treatment with retromolar miniscrews seems to be faster than with midpalatal or buccal implants. Although we do not have as much long-term experience with the retromolar screws, we have no reason to believe the results will have any more tendency to relapse.

The placement technique for retromolar miniscrews is less invasive than that required for

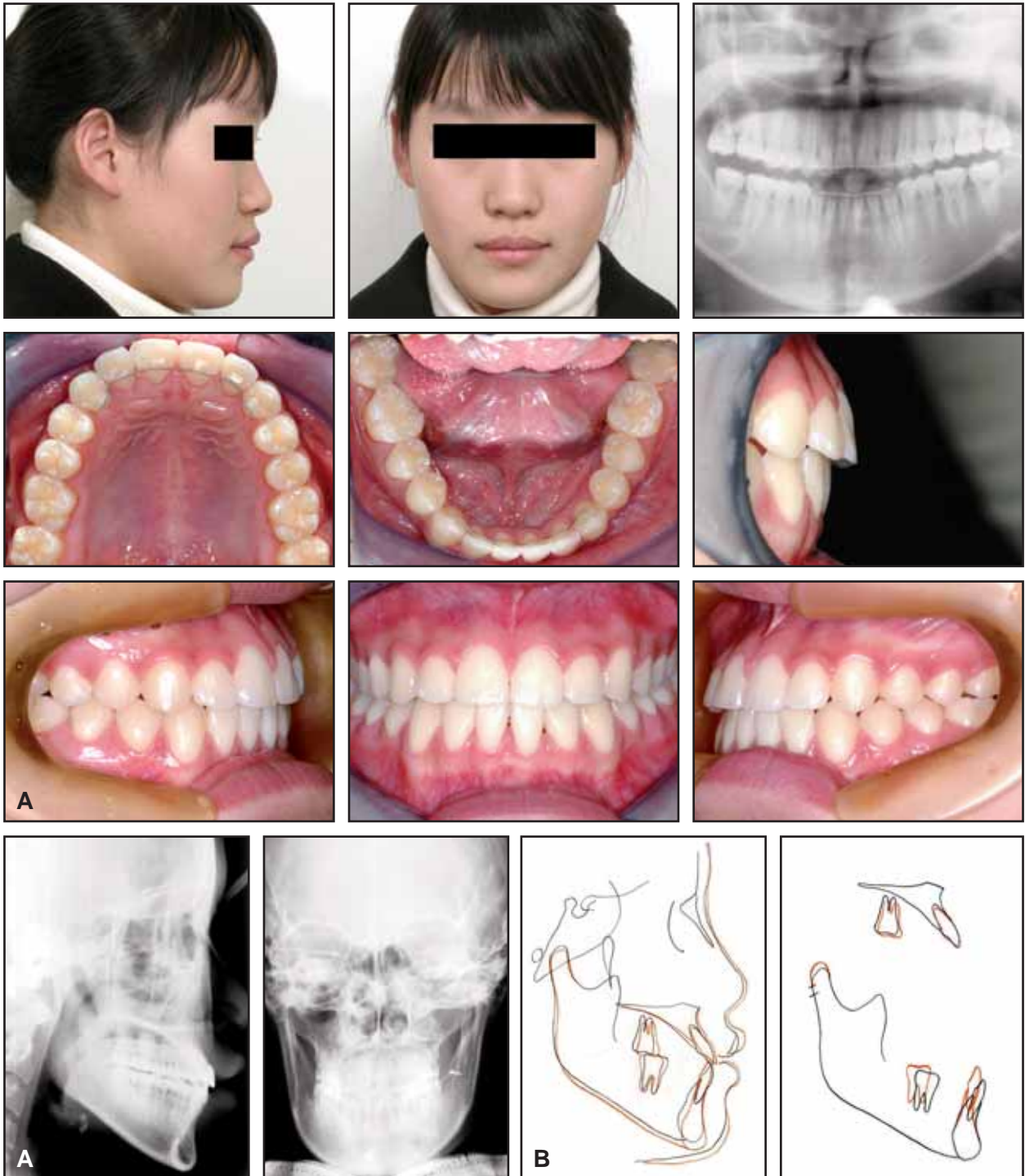


Fig. 3 A. Patient after 16 months of treatment. B. Superimposition of pre- and post-treatment cephalometric tracings.

osseointegrated implants, and the miniscrews are easier to remove. Because the soft-tissue drape tends to be thicker in the retromolar region than in other areas, however, miniscrew placement still requires flap surgery. This is why we refer these cases to an oral surgeon rather than inserting the screws in the orthodontic office. While the 6mm-long miniscrews worked successfully in this case, 9mm or 12mm screws might be preferable for the thicker soft tissue. Whether the traction was open-pull or closed-pull seems to have made no difference in terms of oral hygiene and susceptibility to infection.

The elongation of the lower incisor region could be attributed to the upward direction of the distalizing force from the miniscrews, which were situated slightly above the level of the occlusal plane. This effect, along with the lingual inclination of the lower incisors, seems to have helped correct the anterior overbite.

Conclusion

The present case shows that miniscrews implanted in the retromolar pad can provide enough anchorage for differential retraction of the entire mandibular dentition. When the clinician is faced with borderline decisions between surgical and orthodontic treatment or between nonextraction and extraction therapy, the availability of effective skeletal anchorage can tilt the scales toward more conservative treatment.

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