Upper Molar Distalization with a Miniscrew-Supported Distal Jet

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Conventional anchorage for an exclusively intraoral maxillary molar distalizing appliance (a "non-compliance" distalizer) is derived from a combination of dental support (such as the first or second premolars) and palatal support (from an acrylic button placed against the anterior hard palate).[1,2] This type of system almost inevitably leads to some loss of anchorage.[2,3] In addition, the palatal button tends to restrict oral hygiene,[4,5] and larger buttons may inhibit reciprocal mesial movement of the anterior teeth.

Adding more teeth to the anchorage unit–for instance, by bracketing all the maxillary teeth–does not appear to improve the anchorage support.[2,3,6,7] In certain stages of the dentition and under certain periodontal conditions, it is impossible to achieve sufficient anchorage using only the patient's dentition.[1] With conventional appliances, an alternative treatment plan, perhaps involving extractions, may be necessary if no anchorage loss can be tolerated, as in patients with significant dental protrusion, extreme crowding, or a compromised periodontium.

This article describes a modification of the Distal Jet* appliance that relies on skeletal anchorage to enhance the efficiency of maxillary molar distalization.

Miniscrew-Supported Distal Jet

The Miniscrew-Supported Distal Jet (MSDJ) is a skeletonized Distal Jet appliance[8-11] anchored to two paramedian palatal miniscrews (Fig. 1). Elimination of the acrylic palatal button improves the patient's access for oral hygiene.

The preformed telescope-spring assemblies of the Distal Jet are bent to form the occlusal rests, which are bonded to the canines, deciduous molars, or permanent premolars for transverse reinforcement. A soldered or welded wire is added across the anterior palate to connect the two sides of the device. This connecting wire is then attached to the miniscrew heads with wire ligatures and/or light-

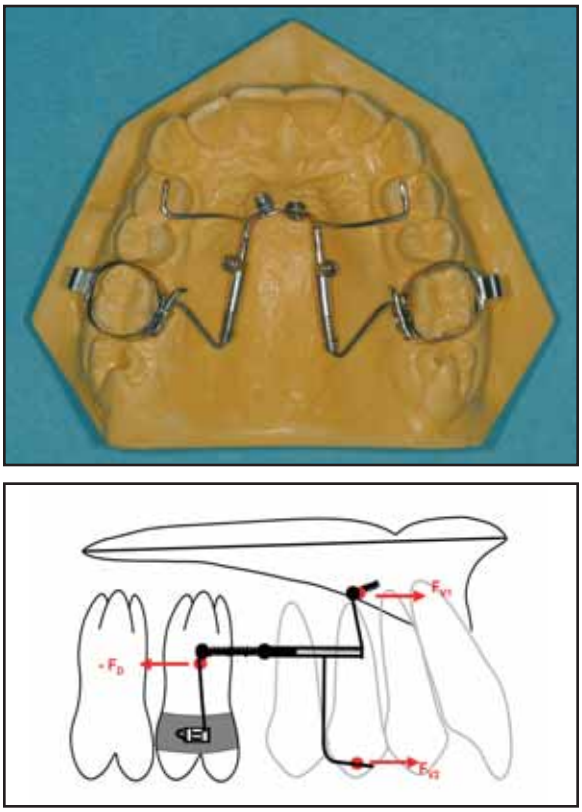

Fig. 1 Miniscrew-Supported Distal Jet (MSDJ).

*American Orthodontics, Inc., 1714 Cambridge Ave., Sheboygan, WI 53082; www.americanortho.com.

**Dual-Top Anchor System, Jeil Medical Corporation, #702, Kolon Science Valley II, 822, Guro-ku, Guro-dong, Seoul 152-050, Korea; www.jeilmed.co.kr. Distributed by Rocky Mountain Orthodontics, Inc., 650 W. Colfax Ave., Denver, CO 80204; www.rmortho.com.

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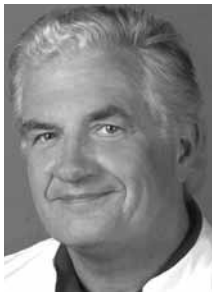

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cured composite. A miniscrew with a pronounced neck and collar is recommended to maximize surface contact with the appliance.

Case 1

A 12-year-old male presented with Class II canine and molar relationships resulting from mesial migration of the upper premolars and molars (Fig. 2). Under local anesthesia, two miniscrews** (8mm long, 2mm in diameter) were inserted at paramedian locations in the anterior palate (Fig. 3).

A skeletonized Distal Jet was fabricated for bilateral molar distalization, with occlusal rests bonded to the first premolars. The activation collars of the MSDJ were unlocked, moved distally to

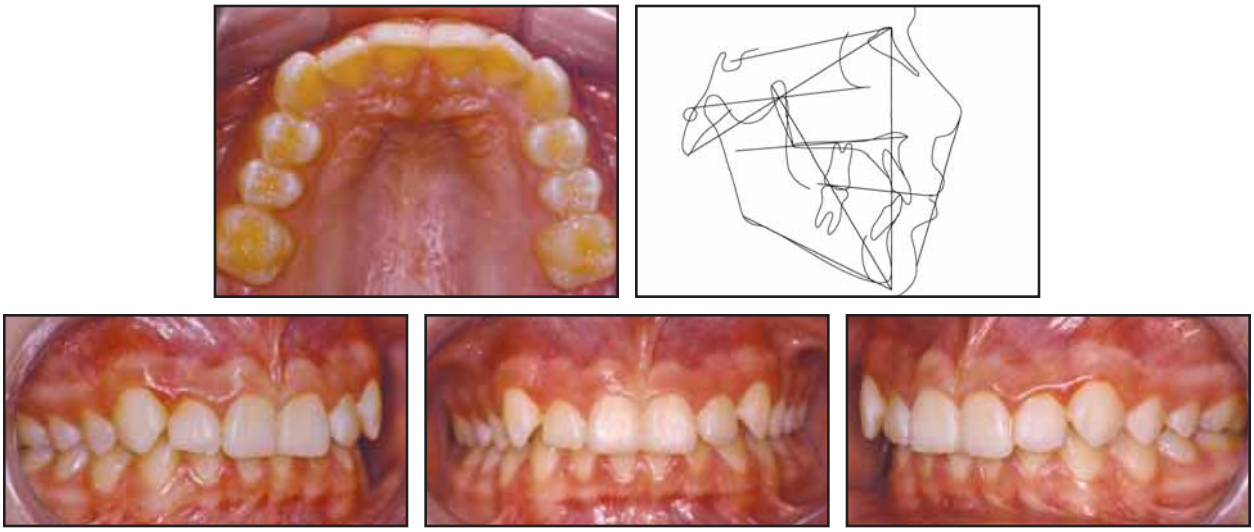

Fig. 2 Case 1. 12-year-old male Class II patient before treatment.

Fig. 3 Case 1. Insertion of two paramedian miniscrews and attachment to MSDJ.

compress the superelastic coil springs with a force of 225g, and then locked down to maintain the activation. The appliance was bonded to the heads of the palatal miniscrews for anchorage.

Bodily molar distalization occurred within eight months, accompanied by some distal movement of the second premolars due to stretching of the transseptal fibers (Fig. 4). The Distal Jet was then removed, and the new molar positions were stabilized using a transpalatal holding arch, without an acrylic button, that was again anchored to the miniscrews (Fig. 5). This made it possible to begin immediate retraction of the premolars and canines. The miniscrews were removed prior to anterior retraction, and the case was completed using conventional fixed appliances (Fig. 6).

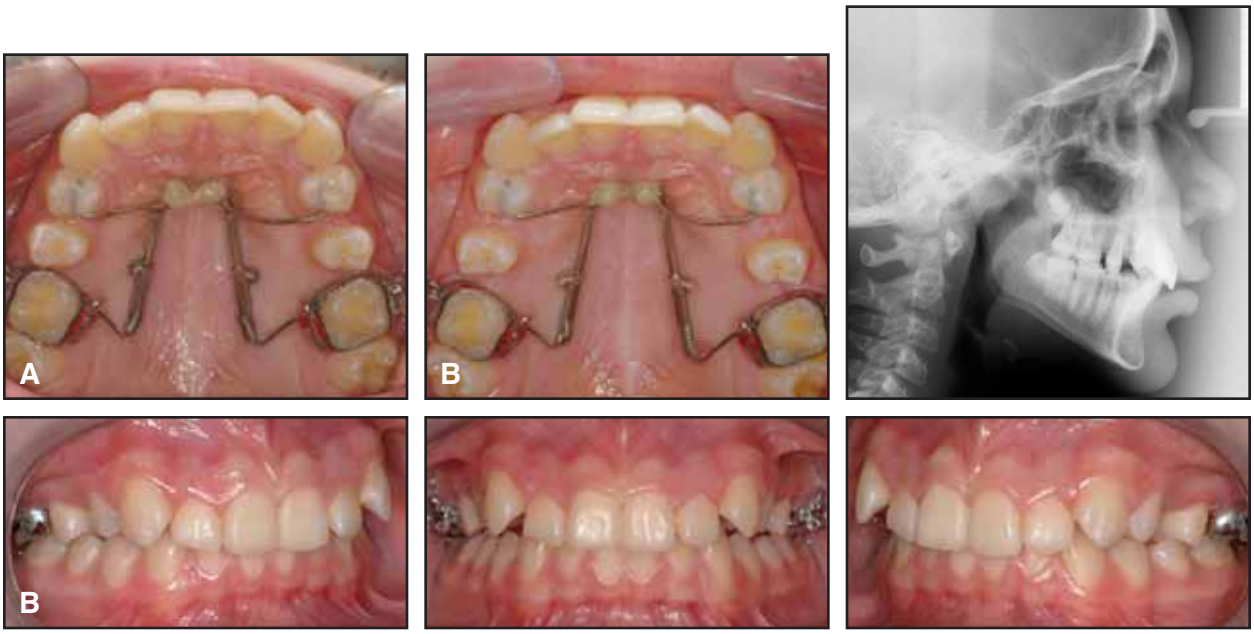

Fig. 4 Case 1. A. Distal movement of second premolars due to stretching of transseptal fibers. B. Bodily molar distalization after eight months of treatment.

Fig. 5 Case 1. Holding arch anchored to miniscrews during retraction of buccal segments.

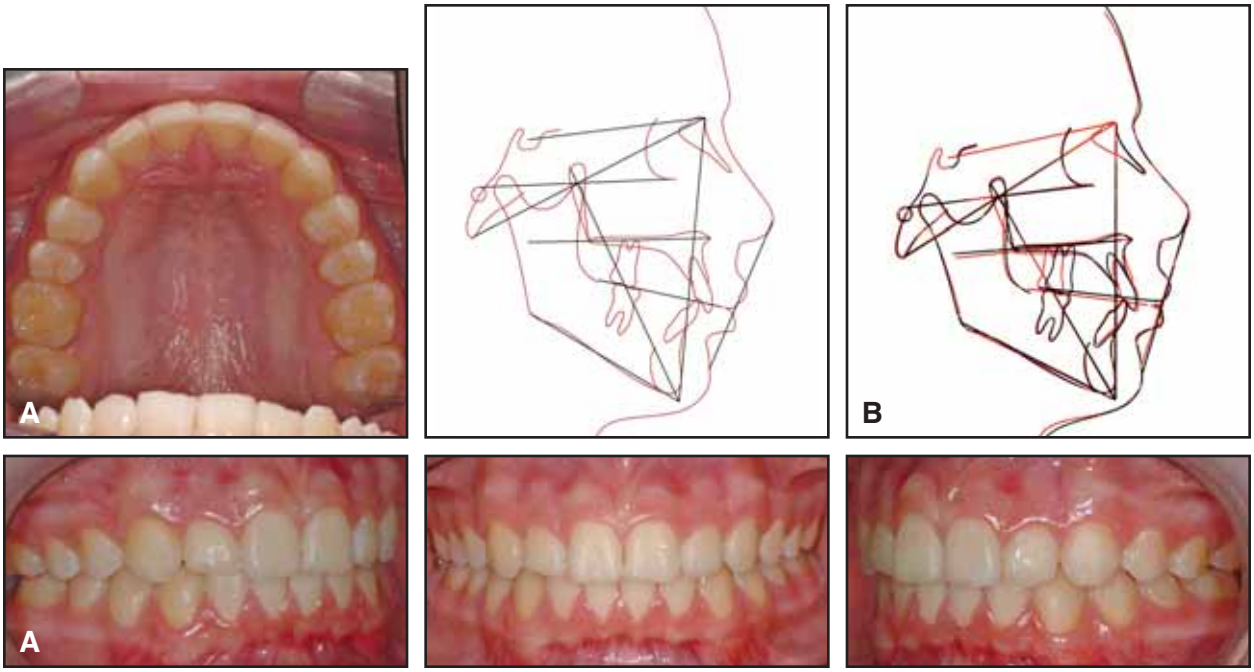

Fig. 6 Case 1. A. Patient after 18 months of treatment. B. Superimposition of cephalometric tracings before treatment and after 12 months of treatment.

Bowman Modification

Another alternative for maxillary molar distalization with miniscrew anchorage support is the Bowman Modification*** of the Distal Jet appliance, in which the tube/piston assembly is replaced by a rigid, U-shaped tracking wire (Fig. 7). This modification is attached to bands on the maxillary first molars and either bands or bonded occlusal rests on the premolars. Occlusal rests will make it easier to seat the appliance and will also provide a small amount of beneficial bite opening.

To activate the Bowman Modification, the mesial activation collars are unlocked, moved distally to compress the superelastic coil springs, and then locked again on the tracking wire. The distal stop collars are only slightly released (⅛ counterclockwise turn), not removed, to permit distal translation of the molars. The coil springs usually need to be recompressed three or four times in a six-to-seven-month treatment period until a super-Class I molar relationship is achieved. Only then are the distal stop collars locked onto the tracking wire.

Fig. 7 Bowman Modification tied with stainless steel ligatures to miniscrew anchors abutting anterior portion of appliance (before attachment to premolar bands).

***AOA Orthodontic Appliances, P.O. Box 725, Sturtevant, WI 53177; www.aoalab.com.

Fig. 8 Alternative placement of miniscrew just posterior to Bowman Modification.

The Bowman Modification is easier than the original Distal Jet to convert to a holding arch because, with the collars locked on each side, the superelastic coil springs can be left in place. To complete the conversion, the premolar supporting wires are cut with a cross-cut fissure bur in a high-speed handpiece. The two locking collars and the soldered ball stop on each side of the tracking wire provide a triple, self-limiting safety that helps prevent subsequent mesial movement of the molars.

If miniscrews are placed just anterior to either the MSDJ or the Bowman Modification, they must be abutted directly against the wire portion to avoid anchorage loss between the device and the implants (Fig. 7). An alternative is to place either one or two implants just posterior to the Distal Jet and attach them to the appliance with stainless steel ligatures (Fig. 8). This approach allows more flexibility in miniscrew location.

Case 2

A 12-year-old male with a Class II, division 2 malocclusion presented in the late mixed dentition (Fig. 9A). Two miniscrews were placed in the anterior palate, between the roots of the canines and first premolars, and a Bowman Modification Distal Jet was tied to the implants with stainless steel ligatures.

After preadjusted edgewise brackets were bonded, a third miniscrew was inserted between the maxillary central incisors. An elastomeric ligature was attached from the implant to T-pins, placed incisally into the vertical slots of the central incisor brackets, to intrude the incisors without J-hook headgear (Fig. 9B).

The incisor angulation was improved and molar distalization completed in eight months (Fig. 9C,D). The Bowman Modification was then converted to a miniscrew-supported holding arch (Fig. 9E), and sliding mechanics were initiated to retract the canines and premolars (Fig. 9F,G).

Discussion

Although endosseous titanium implants have been shown to provide stationary palatal anchorage,[13-15] these implants require more invasive surgical procedures for placement and removal than orthodontic miniscrews do. Because of their smaller size, however, miniscrews should probably be thought of as providing "auxiliary" rather than "absolute" anchorage for intraoral molar-distalization appliances.[1]

If the midpalatal suture is closed, the ideal location for miniscrew insertion is the middle of the anterior palate. In patients who are still growing, the miniscrews should be placed 1-2mm paramedian to the open midpalatal suture.[16]

The important point with either the MSDJ or the Bowman Modification is that the implants should not be permanently attached to the appliance. Thus, if a miniscrew fails, it can easily be removed and replaced in a new location without constructing another distalizer.

Conclusion

The MSDJ and Bowman Modification provide distal translation of the upper molars without the constraints of patient cooperation. Miniscrew support

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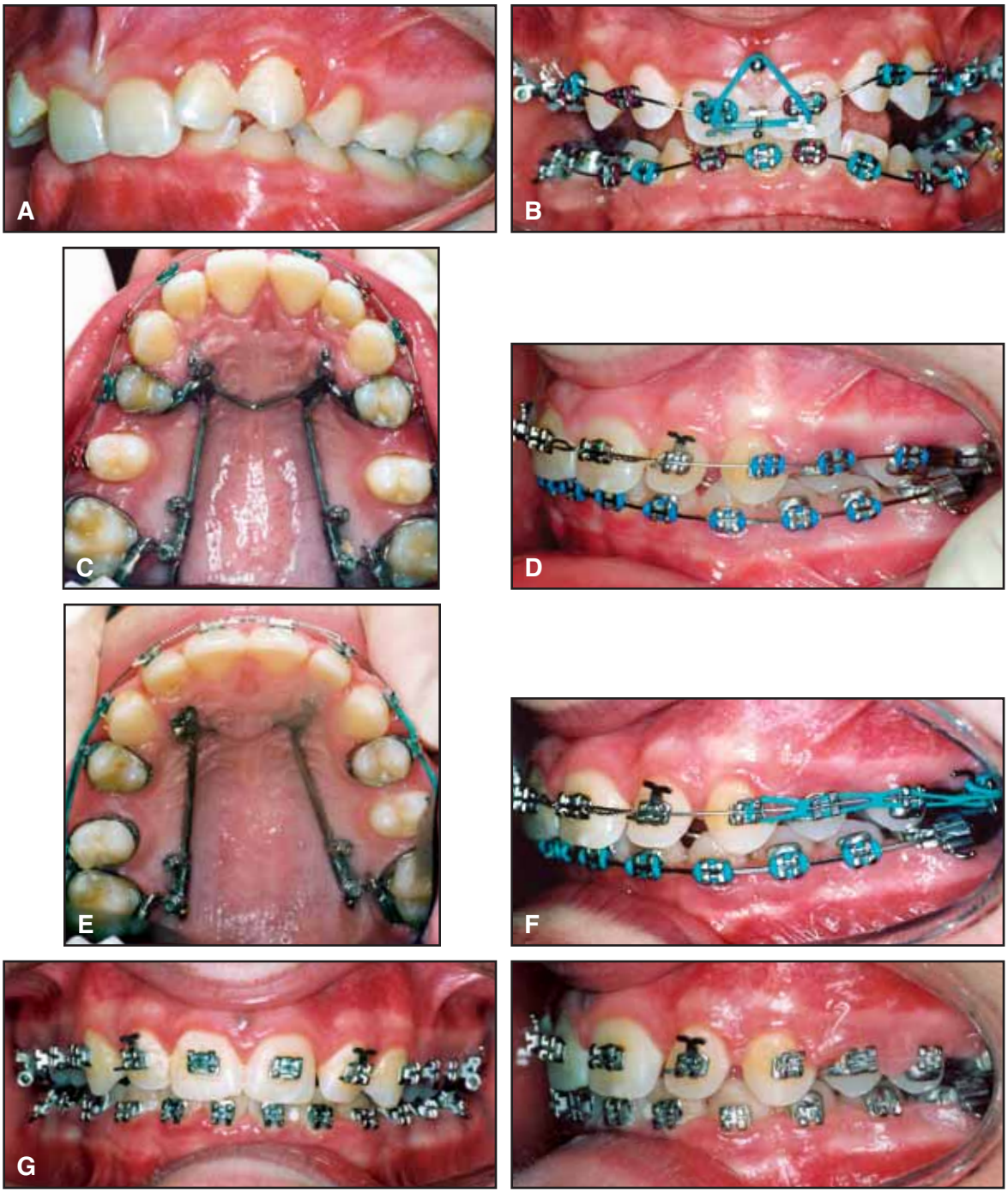

Fig. 9 Case 2. A. 12-year old male patient with Class II, division 2 malocclusion before treatment. B. Bowman Modification anchored to two miniscrews in anterior palate; one additional miniscrew placed labially between upper incisors to intrude incisors during fixed appliance treatment (Butterfly System*[12]). C. Progress of molar distalization after six months of treatment. D. Slightly overcorrected Class I molar relationship after eight months of treatment. E. Bowman Modification converted to miniscrew-supported holding arch (note minor tissue impingement). F. Canine retraction begun immediately after completion of molar distalization. G. Patient after 17 months of treatment.

reduces anchorage loss and flaring of the anterior teeth compared to conventional anchorage methods. After molar distalization has been completed, the modified Distal Jet can be converted to a holding arch, still supported by miniscrews, for more efficient retraction of the remaining maxillary teeth.

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