Mandibular Molar Distalization with the Franzulum Appliance

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Many extraoral and intraoral methods have been proposed for the distalization of maxillary first molars.[1-3] In 1992, Hilgers introduced one such appliance, the Pendulum,*[4] whose dental effects have been previously described.[5,6]

Gaining space in the mandible is more difficult than in the maxilla.[7] Extraoral appliances are seldom attached to the mandibular molars because of the pressure they place on the condyles.[8] The most commonly used intraoral appliances are lip bumpers, lingual arches, and removable appliances with screws or springs (which depend on patient compliance for their success[9]).

Recently, Üner and Haydar reported the use of a Jones Jig,** with a modified lingual arch as an anchorage unit, to distalize and rotate mandibular first molars.[10] While they showed an average distalization of 4mm and distal rotation of 8.6° in two and half to three months, they also observed a .3mm loss of anchorage and 3.3° protrusion of the anterior teeth.

This article presents a new device, based on the Pendulum, that can distalize mandibular molars without the drawbacks of other appliances.

*Ormco/"A" Company, 1717 W. Collins Ave., Orange, CA 92867.
**American Orthodontics, 1714 Cambridge Ave., Sheboygan, WI 53082.

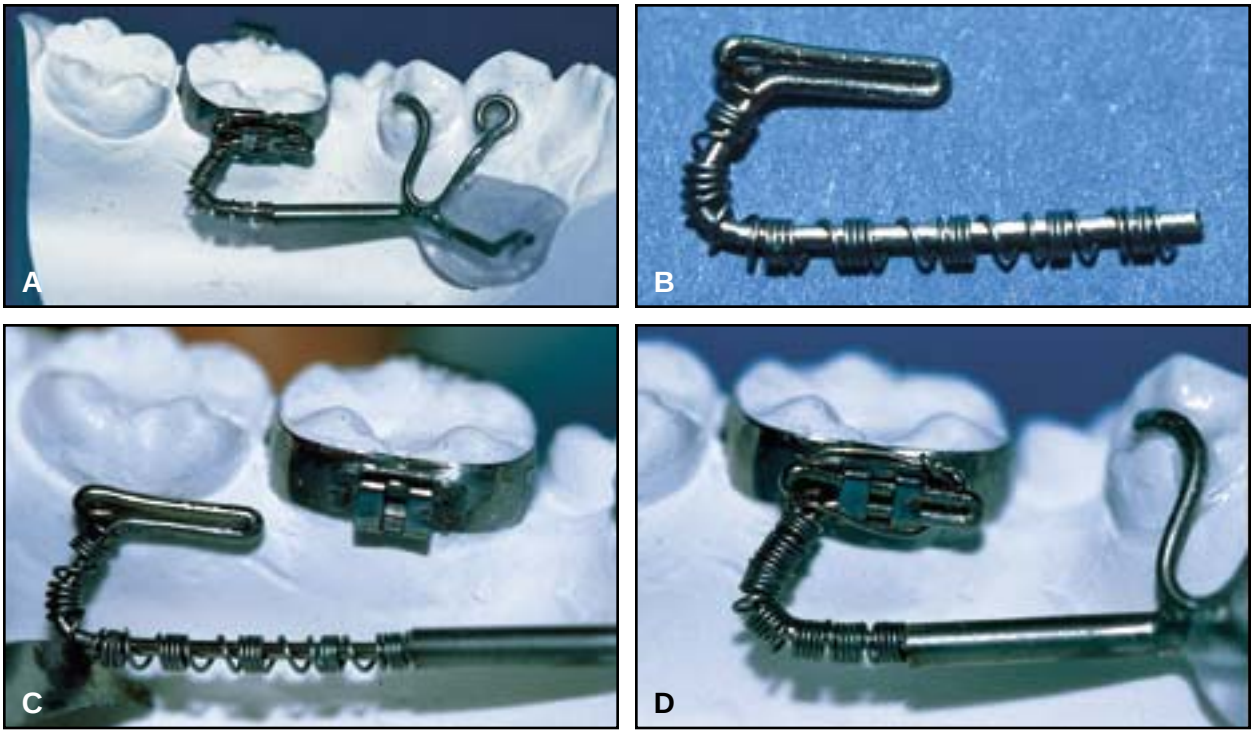

Fig. 1 A. Franzulum Appliance. B. Nickel titanium coil spring over J-shaped wire. C. Posterior distalizing unit inserted into tube of anterior anchorage unit. D. Recurved portion of J-shaped wire tied into molar band sheath.

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Appliance Design

The Franzulum Appliance's anterior anchorage unit is an acrylic button, positioned lingually and inferiorly to the mandibular anterior teeth, and extending from the mandibular left canine to the mandibular right canine (Fig. 1A). The acrylic should be at least 5mm wide to avoid mucosal trauma and to dissipate the reactive force produced by the distalizing components. Rests on the canines and first premolars are made from .032" stainless steel wire. Tubes between the second premolars and first molars receive the active components.

The posterior distalizing unit uses nickel titanium coil springs,*** about 18mm in length, which apply an initial force of 100-120g per side. A J-shaped wire passing through each coil (Fig. 1B) is inserted into the corresponding tube of the anchorage unit (Fig. 1C); the recurved posterior portion of the wire is engaged in the lingual sheath of the mandibular first molar band (Fig. 1D).

The anchorage unit is bonded with composite resin to the canines and first premolars. The J-shaped distalizing unit is then ligated to the lingual sheaths of the molar bands, compressing the coil springs. Thus, the active part of the appliance runs lingually at a level close to the center of resistance of the molar, to produce an almost pure bodily movement.

Case Report

A male patient, age 11 years, 10 months, presented with a dental Class I relationship on the right, a cusp-to-cusp posterior relationship on the left, and a severe space deficiency in both arches (Fig. 2). The maxillary canines and mandibular right premolar were blocked out because of the crowding.

A two-phase treatment was planned, using

***GAC International, Inc., 185 Oval Drive, Central Islip, NY 11722.

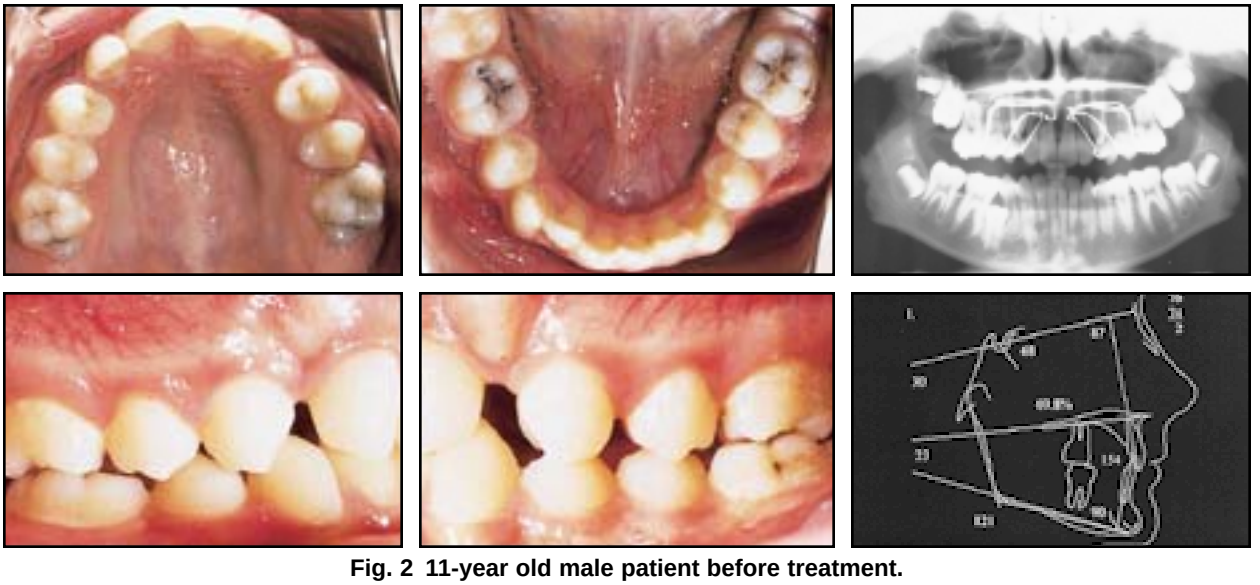

Fig. 2 11-year old male patient before treatment.

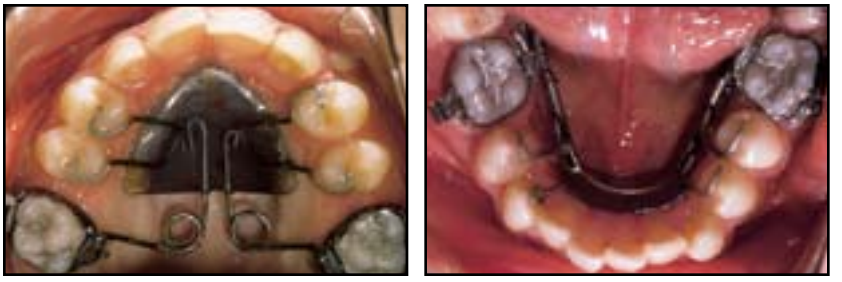

Fig. 3 Upper Pendulum and lower Franzulum Appliance in place.

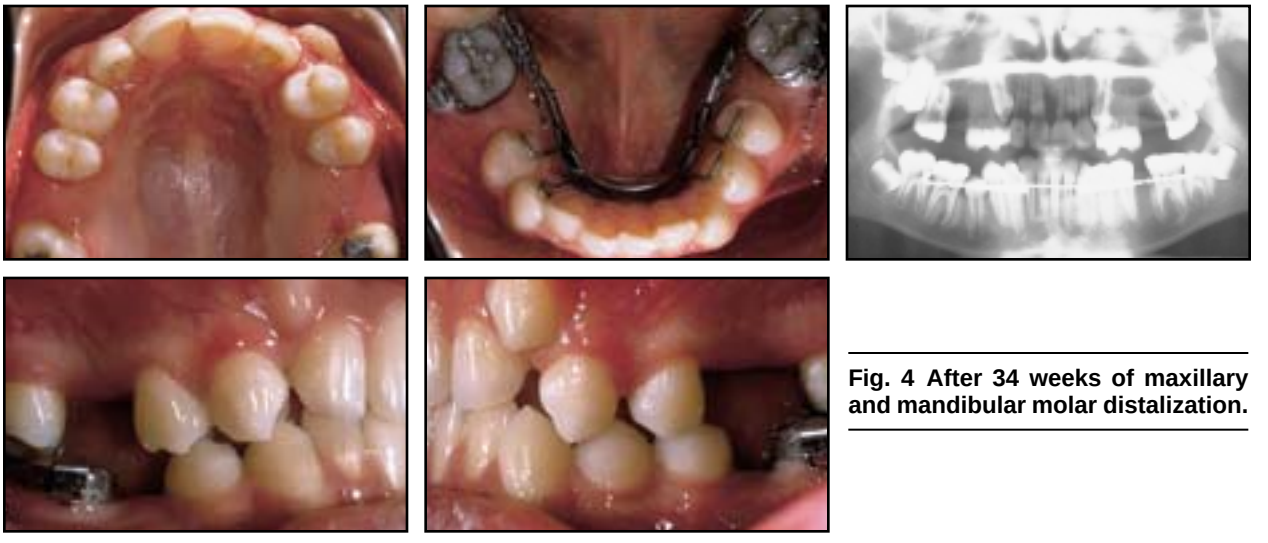

Fig. 4 After 34 weeks of maxillary and mandibular molar distalization.

an upper Pendulum and lower Franzulum Appliance initially to distalize the maxillary and mandibular first molars (Fig. 3). In 34 weeks, this combination created space for eruption of the remaining permanent teeth and relief of the crowding (Fig. 4).

A maxillary Nance holding arch was then worn for 15 months. In the second phase, fixed SPEED† appliances were worn for 28 months, with a cervical headgear and Class II elastics used during the last three months.

At the end of active treatment, the patient showed a Class I molar relationship and ideal overjet and overbite (Fig. 5). There was no significant change in the facial profile. Because the maxillary second molars had not finished erupting and were slightly labial, buccal finger springs were soldered to the Adams clasps of the retainer to guide these teeth into the arch.

Evaluation of Results

The center of the crown was chosen as the reference point for measuring the arch length at each mandibular molar, since an occlusal reference point would exaggerate the distal movement of the tooth. Molar inclination was evaluated at the other extreme, using the angle between the long axis of the molar and the occlusal plane to measure distal tipping. The reference point for the incisors was the midpoint of the lateral projection of the circumference formed by the root-crown junction of the most buccal incisor. Incisor

†Registered trademark of Strite Industries Ltd., 298 Shepherd Ave., Cambridge, Ontario, N3C 4B1 Canada.

TABLE 1
EFFECTS OF MANDIBULAR MOLAR DISTALIZATION WITH FRANZULUM APPLIANCE

	Left First Molar		Right First Molar		Incisor	
	Initial	Final	Initial	Final	Initial	Final
Length	37.0mm	32.5mm	43.0mm	38.0mm	62.0mm	63.0mm
Inclination	80°	80°	84°	80°	75°	74°

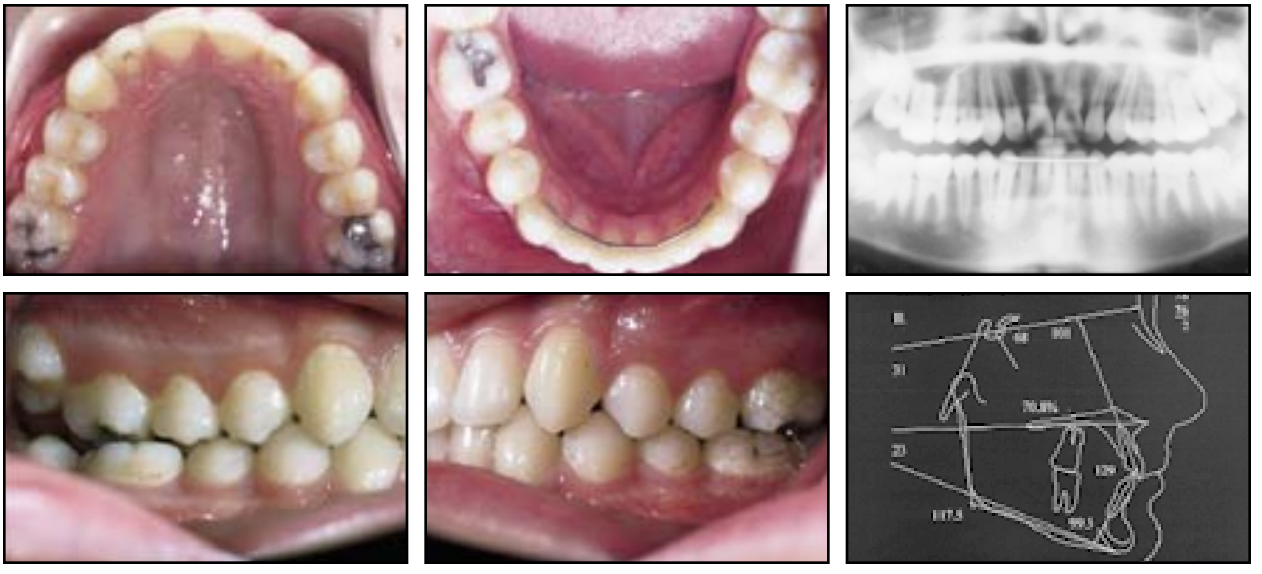

Fig. 5 After 28 months of fixed appliance treatment.

inclination was measured between the long axis of the incisor and the occlusal plane.

During the distalization phase, the mandibular molars moved 4.5-5mm distally (Fig. 6) while the incisors moved 1mm anteriorly (Table 1). The mandibular right molar crown tipped 4° distally, and the mandibular incisor crowns tipped 1° labially. Thus, the movement of the incisor crown resulted in an anchorage loss of 1mm and 1°.

Superimpositions of the initial and post-treatment cephalometric tracings (Fig. 7) showed more bodily movement of the mandibular molar (6mm) than of the maxillary molar (3mm). The mandibular incisors were proclined as a result of the mesially directed forces from the Franzulum Appliance (1mm) and the arch-length increase from the fixed appliances and Class II elastics (an additional 2.5mm); the maxillary incisors remained within normal limits. Some extrusion of both the maxillary and mandibular incisors and molars was also noted.

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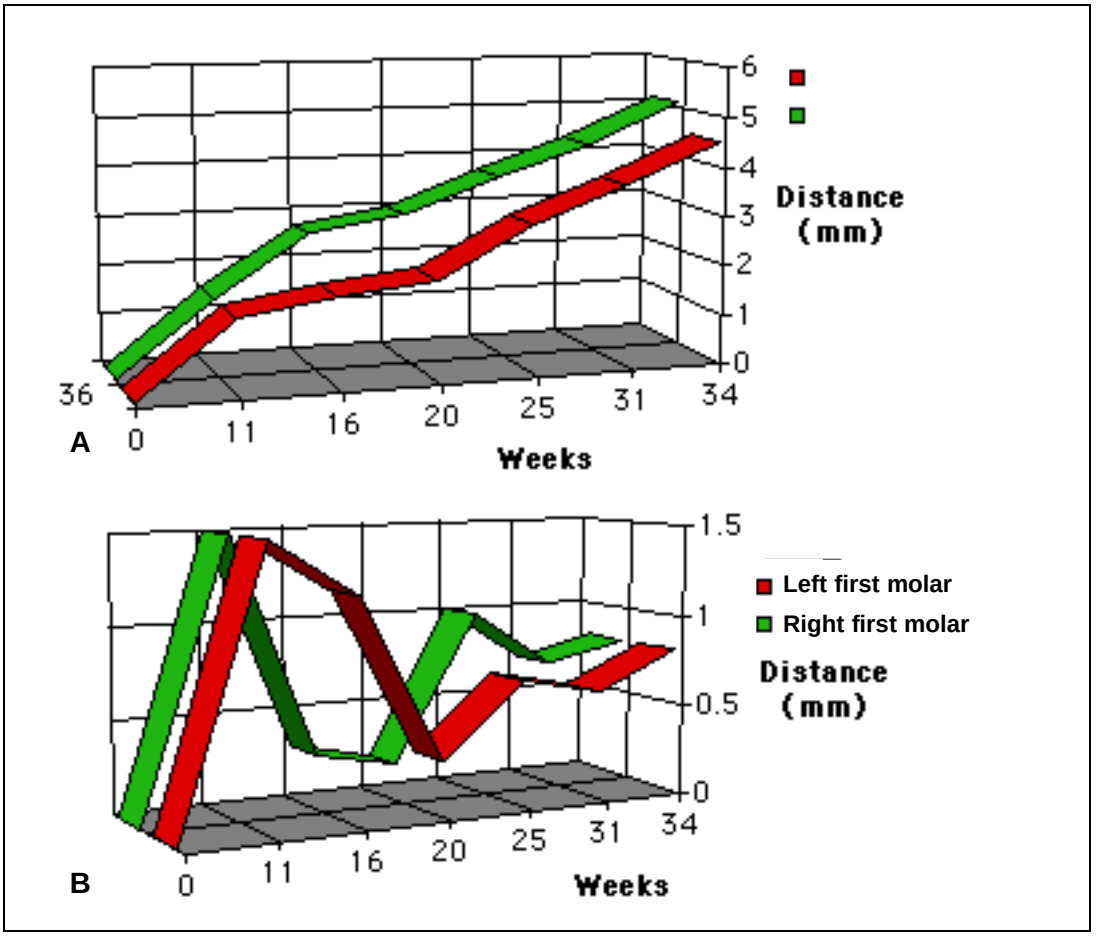

Fig. 6 Space opening in mandibular arch during molar distalization phase. A. Total space gained. B. Rate of space opening.

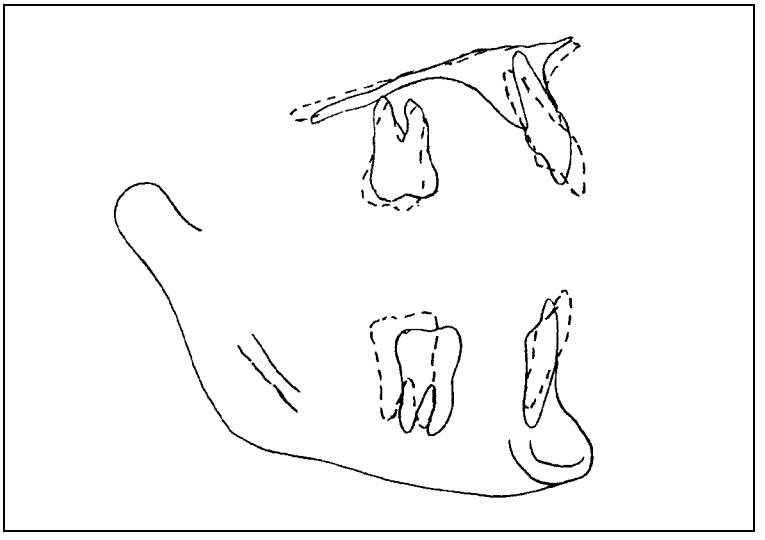

Fig. 7 Superimposition of initial and final cephalometric tracings.

Conclusion

In the case shown here, the Franzulum Appliance was effective in producing distalization of the mandibular first molars. While the appliance shows promise as a method of increasing arch length, further study is under way to evaluate its average dental and skeletal effects, as well as the long-term stability of the molar distalization.

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