Bite Jumping with the Functional Mandibular Advancer

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The new Functional Mandibular Advancer* (FMA) is a fixed functional appliance that can correct a Class II malocclusion without the need for special patient compliance.[1]

Appliance Design

The FMA has a propulsive mechanism that, at first glance, resembles that of the Mandibular Anterior Repositioning Appliance,**[2] but differs in both its mode of operation and its intraoral activation. The FMA relies on the principle of the inclined plane—one of the fundamental concepts of functional orthodontics. Mandibular inclined planes are placed in the buccal corridors, where they will not hinder swallowing or articulation (Fig. 1). The bite-jumping protrusion guide pins are fitted to the upper portion of the appliance at a 60° angle to horizontal, ensuring active, forward mandibular guidance during even partial jaw closure. Reactivation in the sagittal plane is performed simply by moving the guide pins to a more forward threaded support sleeve. This gradual activation allows patients, particularly adults, to adjust to the appliance.

Unlike the telescoping Herbst*** mechanism, the FMA provides nearly frictionless functional movements. Disadvantages of the Herbst appliance—including anterior visibility; the tendency of the rods to fall out of the tubes upon excessive mouth opening; the risk that bent rods may increase friction in the tubes; impingement of the ascending rami and ulceration of the oral mucosa caused by overextension of the rods; and irritation of the buccal mucosa in the lower bicuspid areas by the mandibular screws[3-5]—were taken into consideration when designing the FMA.

Functional appliances such as Twin Blocks[6] and double plates[7] operate similarly to the FMA, but are removable and therefore dependent on patient compliance. The FMA's standardized components make it simple to fabricate and to customize in the laboratory; depending on the case, for instance, it can be constructed with cast splints or crowns as well as with bands.

*Forestadent, USA, 2301 Weldon Parkway, St. Louis, MO 63146 (available spring 2006).

**Registered trademark of Dr. James Eckhart.

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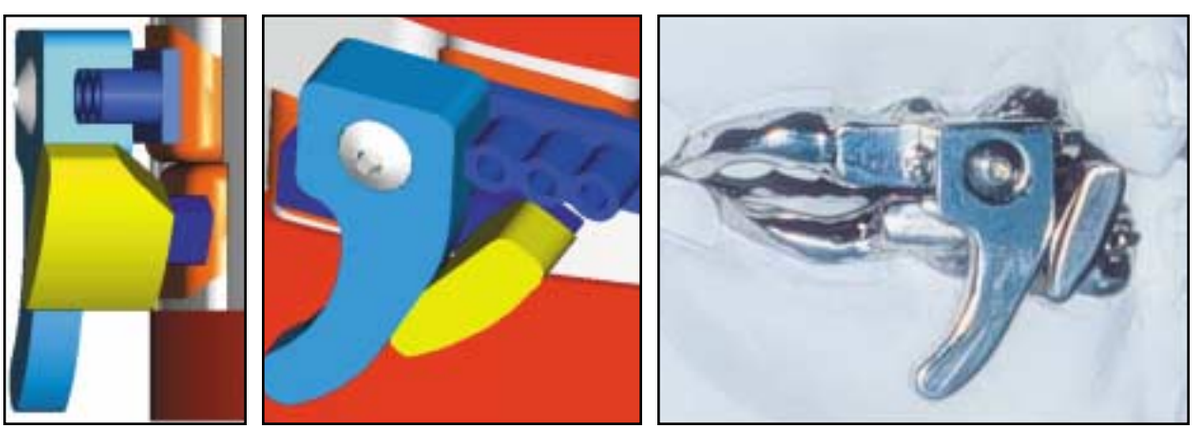

Fig. 1 Functional Mandibular Advancer (FMA), with upper protrusion guide pin contacting lower inclined plane.

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Case Report

A 16-year-old male presented with a Class II, division 2 malocclusion (Fig. 2). After 10 months of intrusion and protrusion of the maxillary anterior teeth and development of the dental arches with a fixed sectional appliance (Fig. 3), an FMA was fabricated to correct the bite in the

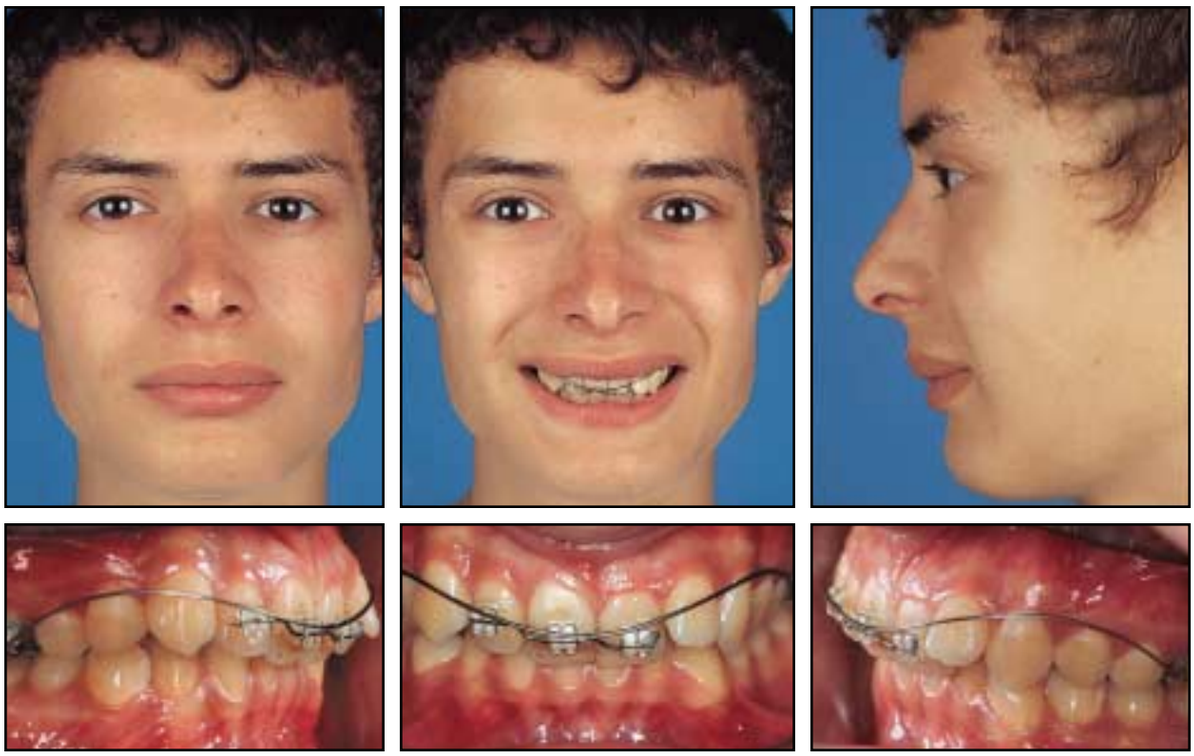


Fig. 2 16-year-old male patient with Class II, division 2 malocclusion at beginning of treatment.

Fig. 3 After 10 months of initial leveling with sectional fixed appliance.

sagittal dimension. The protrusion guide pins and inclined planes of the appliance were laser-welded to cast occlusal splints (Fig. 4).

The guide pins were long enough that the patient found it difficult to move away from the therapeutic position (Fig. 5). After only three months of wearing the FMA, the patient was able to protrude the mandible significantly forward from the therapeutic position (Fig. 6). Four and a half months later, the FMA was removed.

Treatment was completed by leveling the arches with fixed appliances. After 25 months,

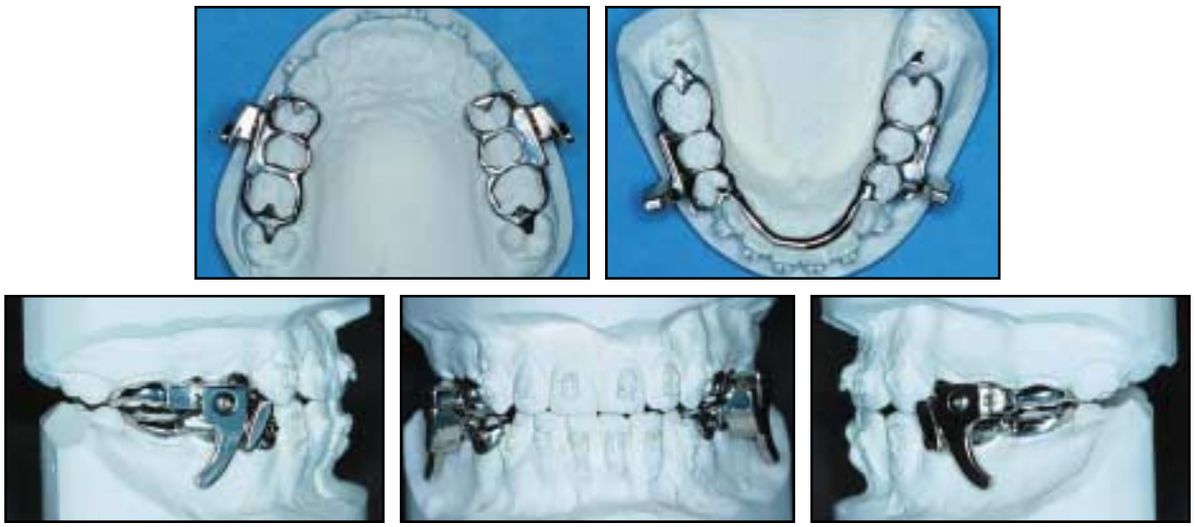


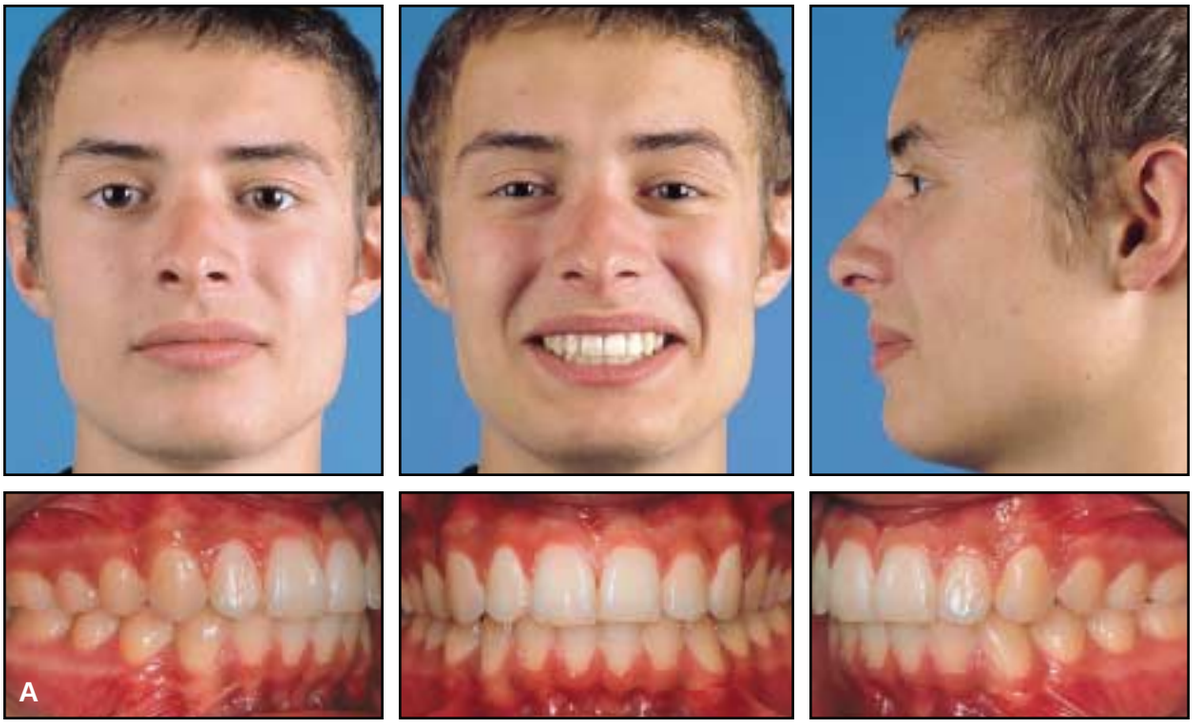
Fig. 4 FMA on working casts, with protrusion guide pins and inclined planes laser-welded to cast occlusal splints on posterior teeth.

Fig. 5 Advancement by FMA into therapeutic position.

Fig. 6 Maximum protrusion of mandible after three months of FMA treatment.

the patient displayed Class I canine and molar relationships and an esthetic orofacial balance (Fig. 7). Superimposition of cephalometric tracings showed that the bite jumping was due to a combination of skeletal and dentoalveolar effects.[8]

Parasagittal, closed-mouth magnetic reso-



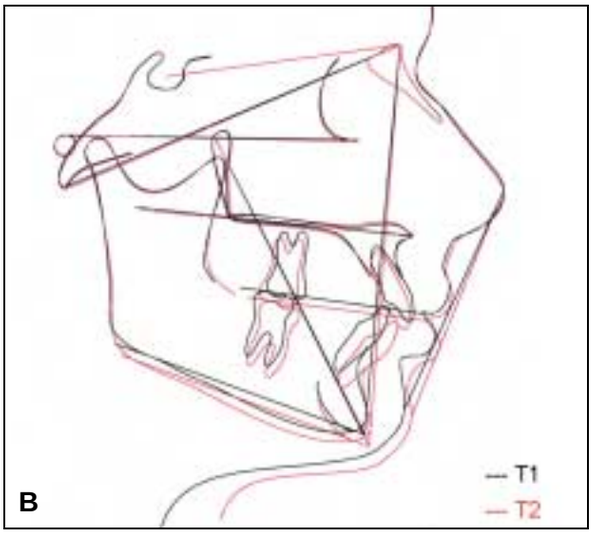


Fig. 7 A. Patient after 25 months of treatment. B. Superimposition of cephalometric tracings before (T1) and after (T2) FMA treatment.

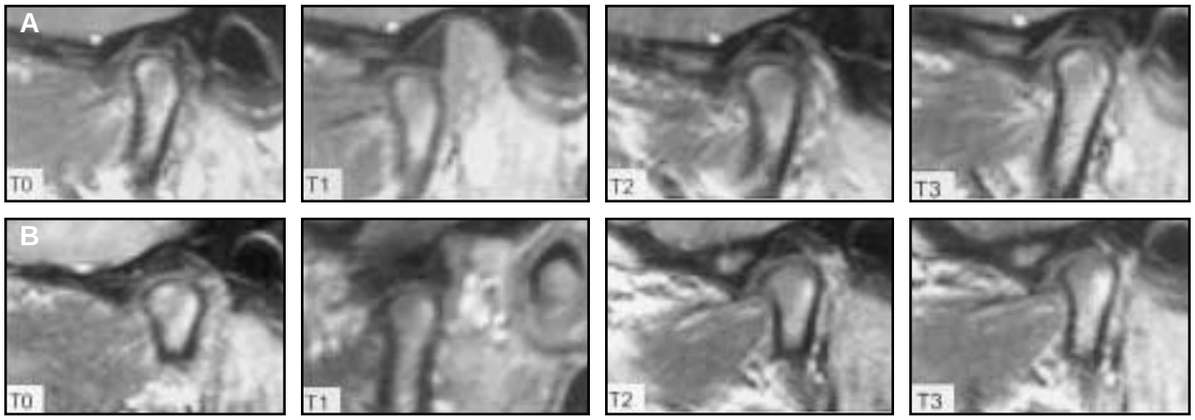


Fig. 8 Parasagittal magnetic resonance images of TMJ region before treatment (T0), at start of FMA treatment (T1), after three months of FMA treatment (T2), and after seven and a half months of FMA treatment (T3), showing physiological disc-condyle relationships before treatment (T0) and after FMA removal (T3). A. Central slices of right TMJ. B. Central slices of left TMJ.

nance imaging sequences of the TMJ revealed that the condyles were deflected from the glenoid fossae toward the ventral and caudal after FMA insertion, but returned to their initial, centered locations at the end of treatment (Fig. 8). In other words, the occlusal correction was not achieved at the cost of a physiologically undesirable change in the TMJs.

Discussion

Fixed functional appliances designed for Class II correction exert a protrusive force on the mandible, the amount of which depends on the rigidity of the device and the extent of retrognathism. Although these appliances can all produce permanent effects without special patient compliance, elastic bimaxillary fixed appliances have been found to achieve mainly dentoalveolar correction,[9-11] while rigid devices have been shown to have more extensive skeletal effects, mostly because of the stimulation of adaptive osseous remodeling in the TMJs.[12-17]

Compared to similar fixed functional appliances, the FMA offers several advantages:

- It is rigid enough to advance the mandible continuously into the therapeutic position, even in adult patients.
- Its action is based on the principle of the inclined plane.
- Its design prevents friction between the active components.
- Its placement in the buccal corridors makes it nearly invisible.
- Its protrusion guide pins are easily reactivated within the support sleeves.

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