

Lower Molar Distalization with the Unilateral Frozat Appliance

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Other than the third molars and maxillary canines, the mandibular second premolars have the highest percentage of impaction. One of the major causes is early extraction of the deciduous predecessor, which can cause a mesial drift and tilt of the molars that impedes the eruption of the second premolar.¹

Placing an open-coil spring on the archwire between the first molar and the first premolar is the technique most commonly used to move the

migrated molars back to their original positions and create enough space for the impacted tooth to erupt. To prevent a reactive mesial drift of the anterior teeth, however, the upper arch must be anchored with a headgear and intermaxillary Class III elastics.

This article describes an alternative treatment, using an asymmetrically activated lingual arch, that allows an intersegmental correction of the malocclusion. A rigid and passive buccal wire

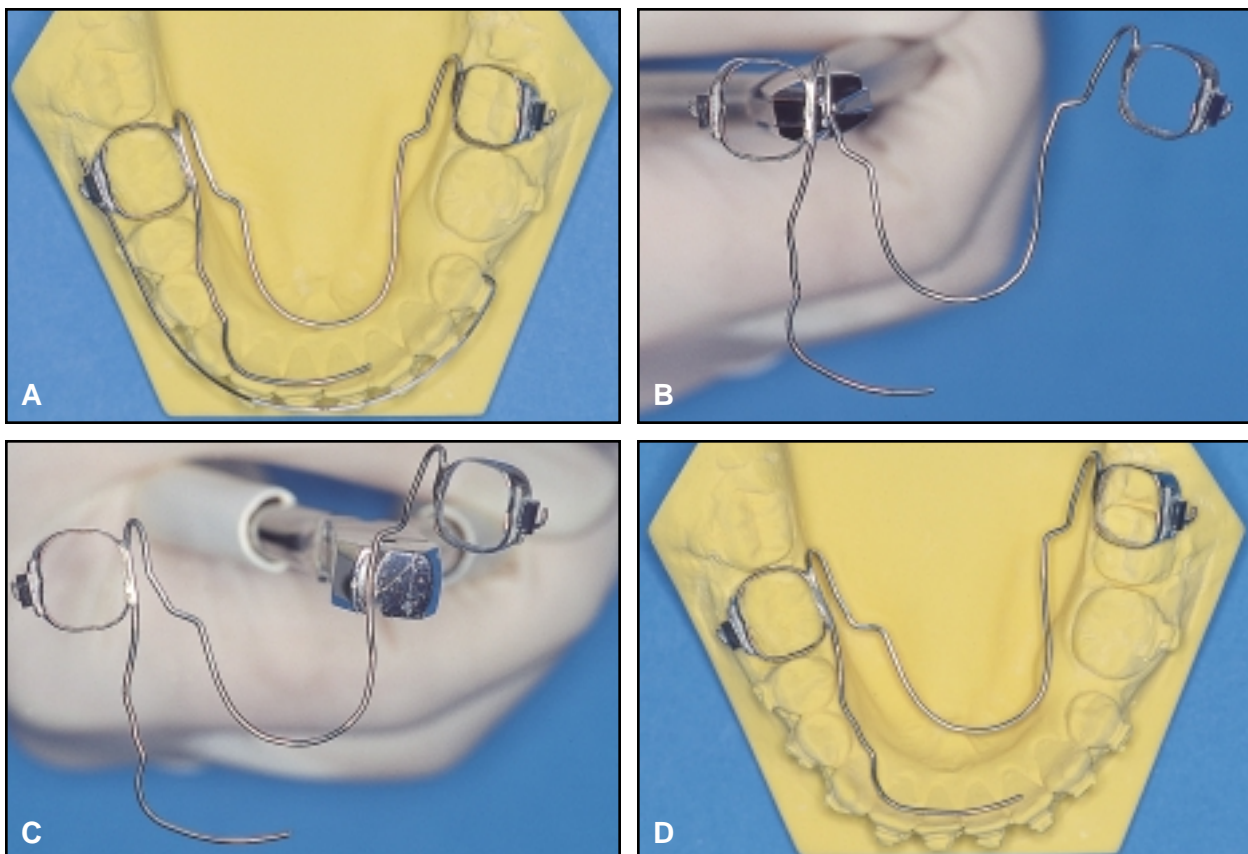


Fig. 1 A. Passive unilateral Frozat appliance on patient's cast. B. Lingual arch activated at anchor molar band with three-prong plier. C. Antirotation bend placed in lingual arch at target molar band. D. Appliance activated with about 200g of force.

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segment provides sufficient anchorage without the need for special patient cooperation.

Unilateral Frozat Appliance

A modification of the Frozat (fixed Crozat) appliance initially developed by Mayes,² the unilateral Frozat appliance consists of two molar bands soldered to an .038" Blue Elgiloy* or .040" stainless steel wire³ (Fig. 1A). The wire is fabricated on the patient's setup cast with lingual steps bent mesial to the molars and the distance from the alveolar process kept as constant as possible in the anterior segment. On the anchor side, the lingual arch is bent into an occlusal U-loop, distal to the solder point on the molar band, then curved around to form the lingual arm of the appliance. Care must be taken to ensure that this arm is in contact with the lingual surfaces of all the anchor teeth, and that the wire segment inserted buccally on these teeth is as rigid and passive as possible. The lingual arm and the segmental archwire combine to form one large, multiroot anchor unit, as described by Bench with regard to the Quad Helix.**⁴

The unilateral Frozat appliance is activated by using an Aderer three-prong plier to make a 1st-order bend on the anchor side of the lingual arch, near the molar band (Fig. 1B). An antirotation bend must then be placed in the lingual arch in the region of the molar to be distalized (Fig. 1C). This activation eliminates the risk of any contact between the molar root and the lingual cortical bone, so that the desired distalization takes place in the cancellous bone. Before placing the appliance in the mouth, a distalizing force of about 180-200g should be verified on the cast (Fig. 1D).

The appliance must be inserted with caution

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to preserve the activation and prevent distortion of the bands. We recommend first inserting the molar band on the anchor side and then extending the appliance along the lingual surfaces of the teeth until the molar band on the distalization side can be cemented without difficulty. If necessary, the unilateral Frozat appliance can be extraorally reactivated and recemented at later appointments.

Case Report

A 10-year-old female presented with a skeletal Class II malocclusion and bialveolar protrusion (Fig. 2). The lower left second deciduous molar had been extracted early because of carious involvement. The maxillary midline was deviated to the right, the upper left central incisor was in infraocclusion, and the upper left posterior teeth had migrated mesially. The lower anterior segment was protruded and spaced, while the lower left first and second molars had migrated mesially to the extent that there was only 1.5mm of space for the impacted lower left second premolar. Consequently, the patient displayed a half-cusp distal Class II relationship on the right side and a half-cusp mesial relationship on the left.

Initial treatment involved the removal of the lower third molar follicles and a functional correction of the skeletal malocclusion with an activator. The entire mandibular arch was leveled with a fixed orthodontic appliance to allow later insertion of a rigid segmental wire for anchorage reinforcement. The anterior segment was retracted, and the spaces were closed (Fig. 3).

At age 12, the patient was fitted for a unilateral Frozat appliance, which was banded to the lower left second molar and right first molar with an activation of about 200g. A rigid buccal archwire was inserted from the lower left first premolar to the lower right second molar to form the anchor unit (Fig. 4A).

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Four weeks later, a distal movement of the lower left second molar could be clearly observed (Fig. 4B). The lower left first molar followed because of the pull of the transseptal

fibers, and the tip of the buccal cusp of the erupting lower left second premolar could be seen.

After 13 weeks, enough molar distalization had been achieved to remove the unilateral

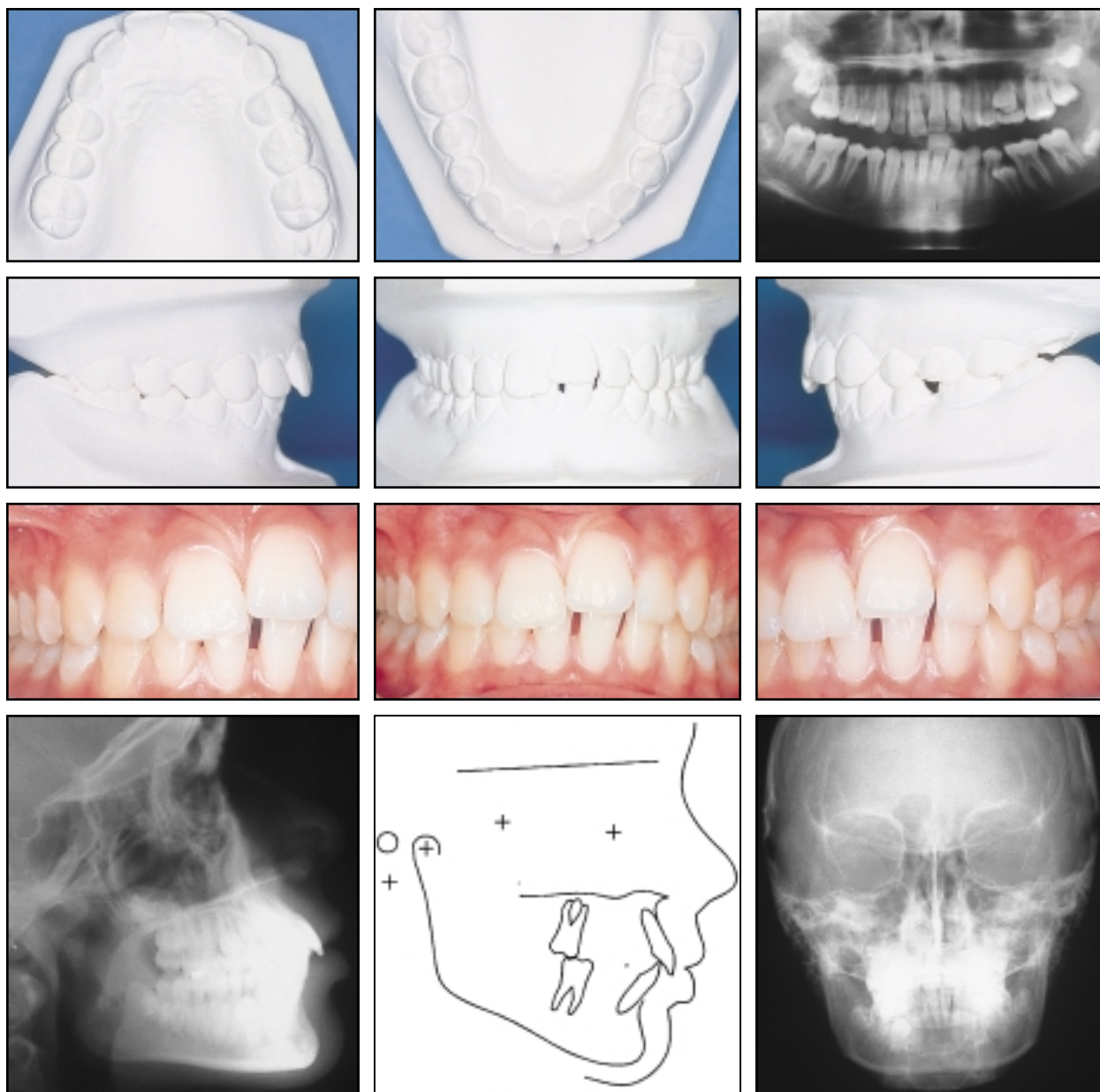


Fig. 2 10-year-old female patient with skeletal Class II malocclusion and bialveolar protrusion before treatment.

Frozat appliance. A bracket was bonded to the lower left second premolar and tied to the continuous archwire with elastic thread (Fig. 4C), and the tooth was subsequently guided buccally

with a second, flexible wire segment (Fig. 4D). Twelve weeks after removal of the lingual arch, a continuous archwire was fully engaged in the lower left second premolar bracket (Fig. 4E).

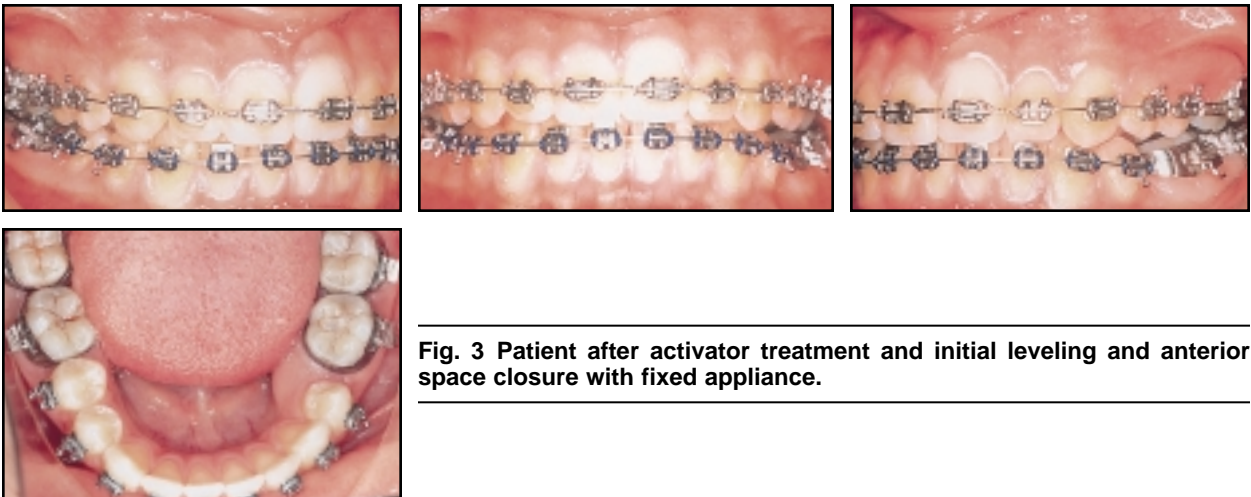


Fig. 3 Patient after activator treatment and initial leveling and anterior space closure with fixed appliance.

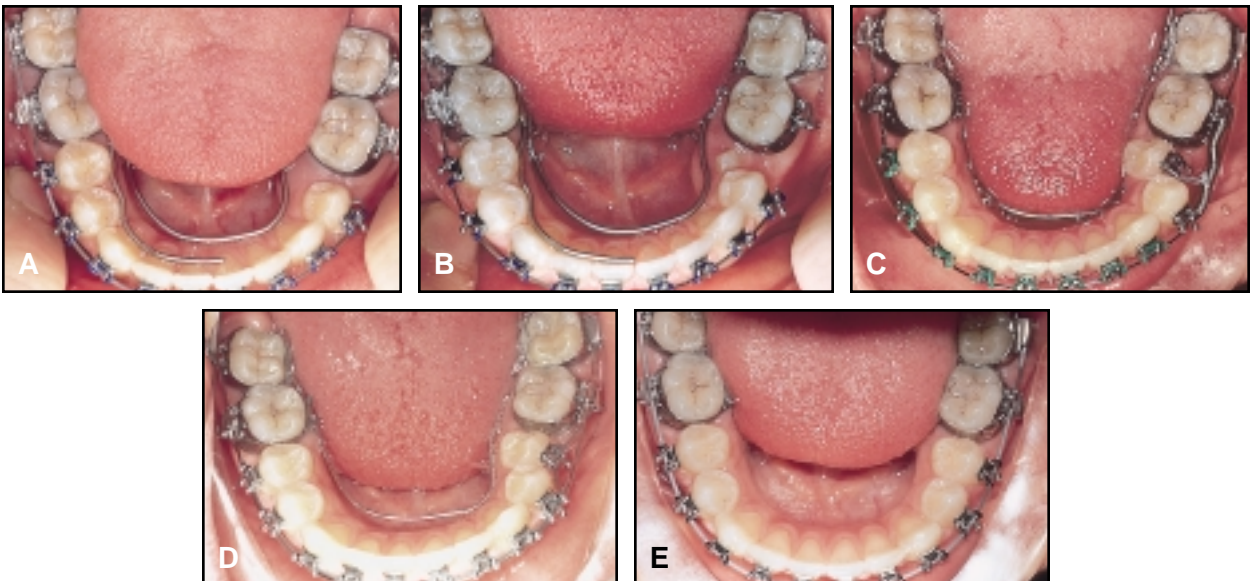


Fig. 4 A. Unilateral Frozat appliance with bands on lower left second molar and right first molar; segmental wire placed buccally on anchor unit, from lower left first premolar to right second molar. B. Distal movement of lower left molars after four weeks, with tip of erupting lower left second premolar visible. C. Molars distalized 6mm after 13 weeks; bracket bonded to lower left second premolar and tied to continuous archwire with elastic thread. D. Unilateral Frozat appliance removed; flexible wire segment used to move lower left second premolar buccally. E. Continuous archwire inserted 12 weeks after removal of Frozat appliance.

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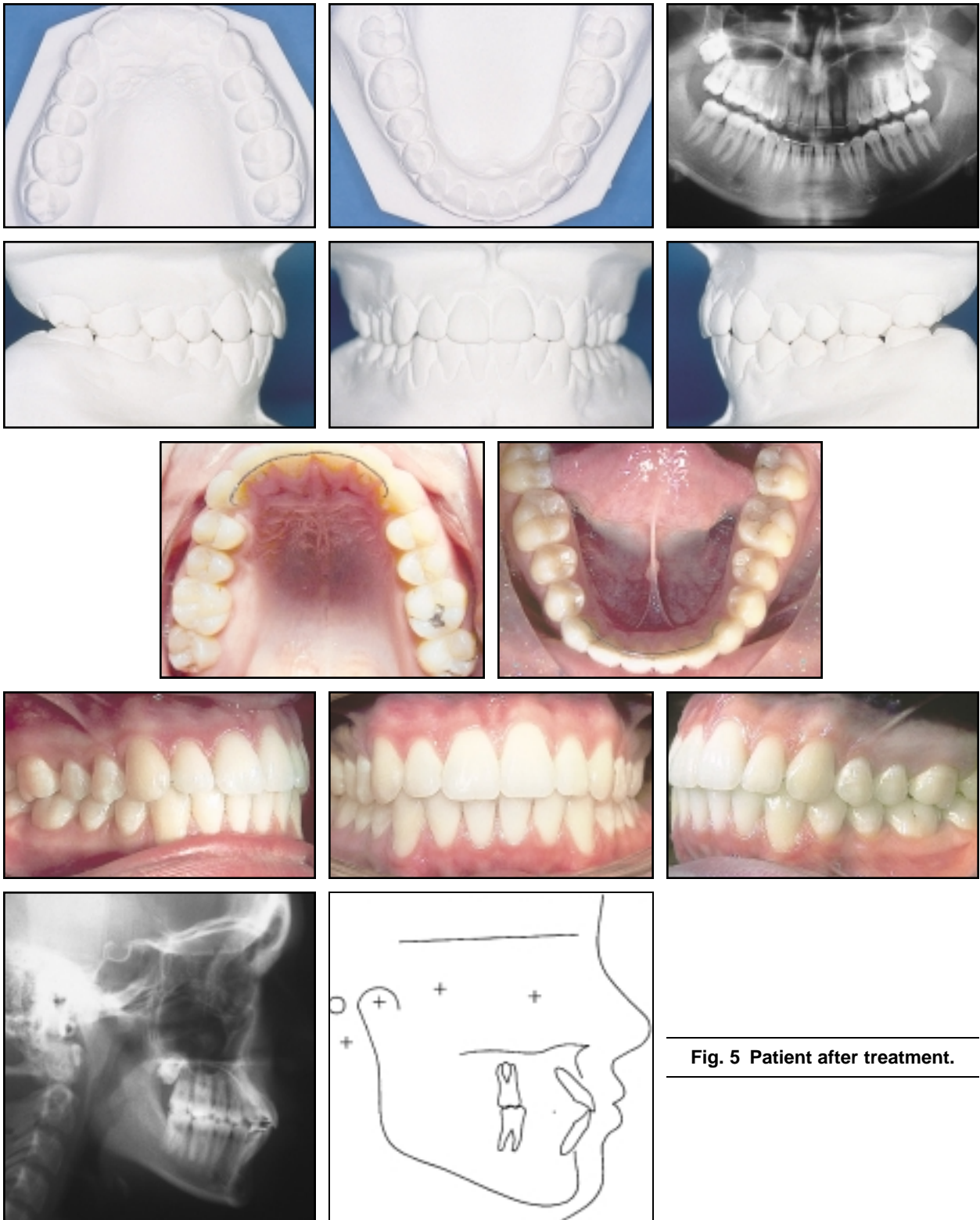


Fig. 5 Patient after treatment.

After treatment, the patient showed a Class I relationship with a symmetrical occlusion in the canine and molar regions (Fig. 5). Post-treatment records demonstrated that the active molar movement was a combination of uprighting and translatory distalization.

Discussion

There is no way to activate a unilateral appliance so that the desired therapeutic force is delivered on one side without the simultaneous generation of an opposing force of equal magnitude on the other side.⁵ The biomechanics of the unilateral Frozat appliance generate a distalizing force against the target molar, but also a mesial force, combined with a mesiobuccal moment, on the contralateral anchor unit. These sagittally acting forces target the solder points between the bands and the lingual arch.

Mesiobuccal moments also occur as a product of the shortest vertical distance of the force vector from the center of resistance of the molar, but these are small and clinically negligible.⁶ The activation bends in the lingual arch should be placed at the level of the molars to ensure that the center of rotation is as close as possible to the center of resistance, making the tooth movement mostly translatory.

The mesially directed force and the mesiobuccal moment acting on the anchor molar are both undesirable side effects that must be absorbed by the anchor unit. A clinical study of the unilateral Frozat appliance has shown that additional stabilization can be achieved by placing a buccal segmental wire of maximum rigidity and passivity on the anchor teeth.³ Anterior protrusion will occur only if the anchorage is insufficient or the force magnitude is too great. In the present case, the anterior segment was actually retruded compared to the beginning of treatment (Fig. 5). Space closure in the lower anterior segment did not produce the space for the lower left second premolar, because the anterior spaces were already closed when the lingual arch was inserted (Figs. 3,4A).

Conclusion

The unilateral Frozat appliance allows a controlled uprighting and distalization of the lower molars. Intramaxillary anchorage is achieved by simultaneously inserting a rigid and passive buccal wire segment. Because the appliance cannot be removed, it ensures an uninterrupted application of force against the target molar without relying on special patient compliance.

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