A Removable Class II Appliance for Simultaneous Distalization and Expansion

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Treatment of a case of Class II malocclusion with maxillary arch constriction and anterior crowding generally involves expanding the arch, distalizing the molars, and aligning the anterior teeth.[1-4] This article introduces a removable appliance that can simultaneously correct a V-shaped upper archform and move the upper molars distally.

Appliance Design

The acrylic plate of the appliance is fabricated with occlusal coverage to maintain anchorage, prevent occlusal interferences, and control the vertical dimension and molar tipping (Fig. 1). Mechanical retention is provided by Adams clasps on the first molars and finger springs on the premolars.

A Bertoni multiple-sector palatal screw* is embedded in the acrylic at the level of the contact points of the first molars and second premolars, bisecting the midpalatal raphe. Placing the screw in this position and sectioning the acrylic plate into three parts makes it possible to simultaneously move the molars distally and expand the anterior archform.

For distalization, the screw is activated in a sagittal direction once a day during the first two weeks. For expansion, a transverse activation is begun in the second week with a quarter-rotation per day. In the third week, both activations should be reduced to every other day until the molars have reached a Class I relationship and sufficient expansion has been achieved. The appliance should then be left in place for passive retention, of about half the duration of the expansion.

*Also sold as the 3D Bertoni screw. Available from Lewa Dental GmbH & Co. KG, Remchingen, Germany; Dentaurum, Inc., Newtown, PA; AOA/Pro, Sturtevant, WI.

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Case Report

A 13-year-old male presented with the chief complaint of retruded upper lateral incisors and canines in supraversion, possibly due to the early extraction of deciduous teeth (Fig. 2). The molar

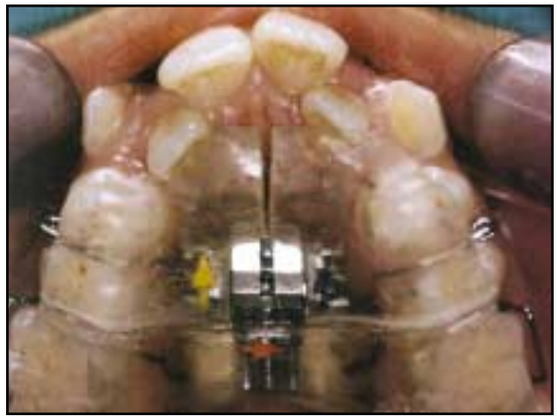

Fig. 1 Removable appliance for simultaneous molar distalization and maxillary expansion.

Fig. 2 13-year-old male Class II patient with retruded upper lateral incisors and canines in supraversion before treatment.

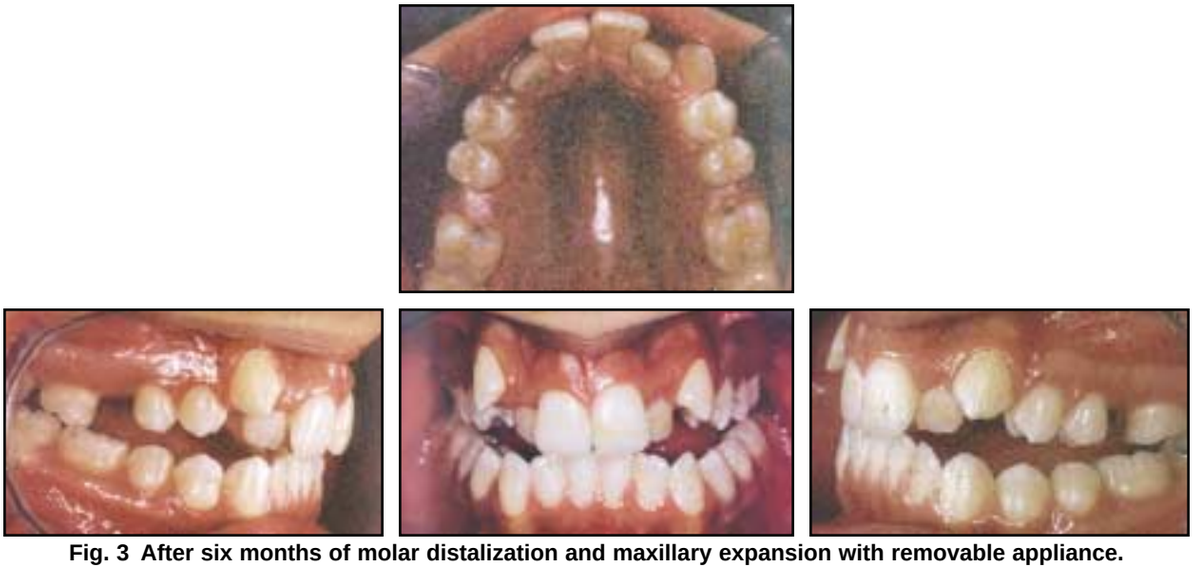

Fig. 3 After six months of molar distalization and maxillary expansion with removable appliance.

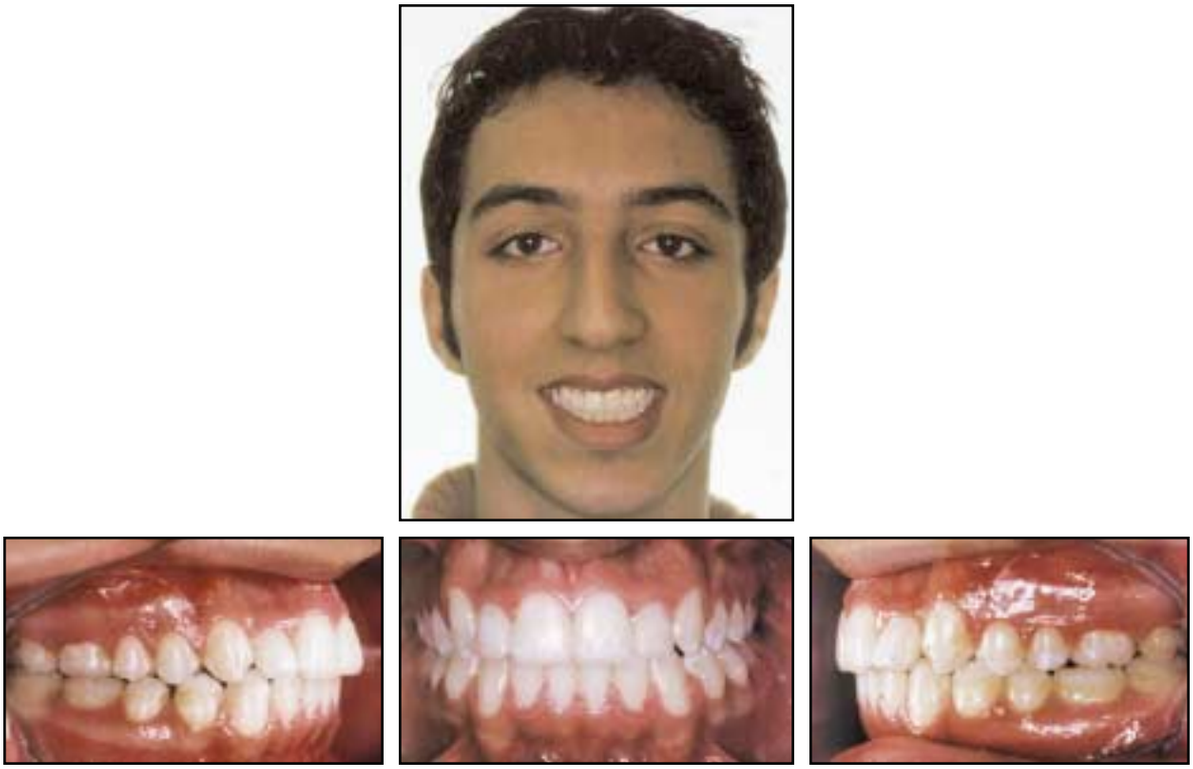

Fig. 4 Patient after 24 months of treatment with removable and fixed appliances.

relationship was a full Class II on the left and a half-Class II on the right. The mesiobuccal cusp of the maxillary right first molar was occluding with the mesiobuccal cusp of the mandibular first molar, while the mesiobuccal cusp of the maxillary left first molar was occluding with the mesial triangular fossa of the mandibular first molar. The patient also had a V-shaped maxillary archform, with a 9mm arch-length discrepancy.

Treatment objectives were to correct the Class II molar relationship, correct the V-shaped upper arch with slow maxillary expansion, prevent downward and backward rotation of the mandible, and align the teeth.

A removable appliance was fabricated as described above, with the acrylic extending to the buccal cusps and palatal surfaces of the retruded lateral incisors. The Bertoni screw was activated for six months, then maintained for three months of passive retention. The appliance was worn full-time, except during meals, and patient cooperation was good.

A Class I molar relationship and sufficient expansion of the upper arch were achieved within six months (Fig. 3). After the three months of retention, a transpalatal arch was placed to correct molar rotations and control anchorage while the teeth were aligned with a Begg fixed appliance (Fig. 4).

The sagittal effect of the removable appliance was to create 6mm of space between the first molars and second premolars on the right side and 4mm on the left side (Table 1). Most of the maxillary expansion was achieved in the premolar region, allowing for correction of the V-shaped upper archform and resolution of the 9mm arch-length discrepancy (Table 2). Cephalometric data showed upper posterior axial

TABLE 1
SPACE GAINED IN SAGITTAL CAST MEASUREMENTS (MM)

Right side	6.0
Left side	4.0

TABLE 2
TRANSVERSE CAST MEASUREMENTS (MM)

	Before Distalization	After Distalization	Difference
2-2	9.5	15.0	5.5
4-4	34.0	41.0	7.0
5-5	41.0	46.0	5.0

TABLE 3
ANGULAR CEPHALOMETRIC MEASUREMENTS (°)

	Before Distalization	After Distalization	Difference
SN-7	58.5	38.0	—20.5
SN-6	61.0	51.0	—10.0
SN-5	65.0	69.0	4.0
SN-1	84.0	81.0	3.0
PP-7	77.5	57.0	—20.5
PP-6	79.0	69.0	—10.0
PP-5	83.5	88.0	4.5
PP-1	102.0	102.0	0.0

TABLE 4
SAGITTAL CEPHALOMETRIC MEASUREMENTS (°)

	Pre-treatment	After Appliance	Post-Treatment
SNA	68.0	68.0	69.0
SNB	64.0	64.0	65.0
ANB	4.0	4.0	4.0
GoGn/SN	45.0	46.0	45.0

TABLE 5
TRANSVERSE CEPHALOMETRIC MEASUREMENTS (MM)

	Pre-treatment	After Appliance	Post-Treatment
Mxr/mxl*	32.5/33.0	34.0/32.0	34.0/32.0
Isf**	—0.5	—0.5	0.0
Iif†	1.5	0.5	0.2
Umr-uml‡	29.0/30.0	33.0/34.0	33.0/34.0

*Maxillare: the intersection of the lateral contour of the maxillary alveolar process and the lower contour of the maxillozygomatic process (right and left).
**Incision superior frontale: the midpoint between the maxillary central incisors at the level of the incisal edges (negative value indicates a shift to the left).
†Incision inferior frontale: the midpoint between the mandibular central incisors at the level of the incisal edges.
‡Upper molar: the most prominent lateral point on the buccal surface of the second deciduous or first permanent maxillary molar (right and left).

changes, but no upper anterior axial changes (Table 3). The mandibular plane angle also remained stable (Table 4).

The soft-tissue chin point was shifted to the left at the beginning of treatment. This asymmetry was nearly resolved by expanding the upper arch and releasing the mandible to its normal, comfortable position, but a slight deviation to the left remained at the end of treatment. The patient refused placement of another appliance to correct this deviation.

Discussion

Most of the space created in this case was achieved by distal movement of the upper molars, and the remainder by mesial movement of the premolars, due to the anterior anchorage loss from reciprocal forces. Cephalometric data revealed an almost bodily movement of the first molars (Table 5). Although the molars displayed about 10° of distal crown tipping (Table 3), this is not much more than has been reported with other techniques,[2] and even less than with some.[4] The post-treatment axial inclinations of the first molars were less than those of the second molars, probably because of the eruption of the second molars and the use of differential forces.[5]

Nearly all intraoral distalization methods produce incisor protrusion as a side effect.[6] The present appliance maintained the axial inclinations of the incisors and the overjet, however, because the acrylic plate was terminated at the palatal surfaces of the retruded lateral incisors. Occlusal coverage of the posterior teeth enabled the appliance to serve as a bite block, ensuring vertical control, and facilitated molar distalization by reducing friction.

Conclusion

The removable appliance shown here allows simultaneous molar distalization and expansion of a V-shaped upper archform. Because it saves chairtime and shortens treatment, it is less costly than similar techniques.

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