RAPID PALATAL EXPANDER: AN ANCHOR UNIT FOR SECOND MOLAR DISTALIZATION IN ANGLE CLASS II TREATMENT

Distal movement of maxillary molars is a common approach for nonextraction treatment of Angle Class II patients. Because of known difficulties involving moving the maxillary first molars distally in the presence of second molars, this article describes how the distally directed force is applied immediately to the second molars. A rapid palatal expander can be used as a reliable unit to facilitate the distal movement of the second maxillary molars. World J Orthod 2010;11:75–84.

Key words: distal molar movement, rapid palatal expander, Class II occlusion, anchorage, bodily movement
PATIENT REPORT

The patient was a Caucasian girl 12 years 8 months of age with no conspicuous medical history. Her chief complaint was “crooked teeth.” Extraoral examination and photographs revealed a well-balanced profile (Fig 1). Intraorally, the patient was found to be an Angle Class II with 5.0 mm overjet, 5.5 mm overbite, and a bilateral posterior crossbite (Fig 2). The analysis of her study casts gave evidence of 5.0 mm of maxillary anterior crowding and a constriction of the maxillary arch.

The panoramic radiograph showed that all teeth were present (Fig 3). According to the cephalometric analysis, the convexity of the hard tissue profile was normal (Table 1, Fig 4). Vertical skeletal measurements indicated a hypodivergent facial configuration. The maxillary posterior teeth had moved mesially, whereas the maxillary incisors were mildly retruded. In contrast, their mandibular counterparts were somewhat protruded.

This patient was diagnosed as having a dental Angle Class II, Division 1 malocclusion with a mesial migration of the maxillary posterior teeth and a bilateral posterior crossbite due to a constricted maxilla with a normal skeletal pattern.
TREATMENT OBJECTIVES

The treatment objectives for this patient were to:

- Correct the dental Class II occlusion
- Eliminate the overjet and correct the overbite
- Resolve the maxillary anterior crowding
- Correct the posterior crossbite

TREATMENT ALTERNATIVES

After considering the patient’s facial profile, the only reasonable treatment alternatives were nonextraction therapy with either cervical traction headgear or distal movement with noncompliance mechanics (combined with Class II elastics).

![Initial panoramic radiograph.](image1)

![Initial lateral cephalometric tracing.](image2)

![Table 1](table1)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean</th>
<th>SD</th>
<th>Initial</th>
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TREATMENT PLAN

The two treatment options were discussed with the patient who refused to wear headgear. Thus, it was decided to use fixed distal movement mechanics with rapid maxillary expansion for crossbite correction. Tooth alignment was accomplished with fixed preadjusted edgewise appliances (Roth technique).

TREATMENT PROGRESS

The maxilla was expanded with a banded Hyrax-type RPE device. The patient was asked to activate this appliance 0.5 mm per day. The active expansion was terminated after 5 weeks when the expander was secured with a brass wire (Fig 5). Fixed preadjusted edgewise brackets and bands (0.022-inch slot) were placed, and leveling and aligning were accomplished with a 0.016-inch Ni-Ti archwire. After banding the maxillary second molars and converting the maxillary first molar bands, a 0.016 × 0.022-inch stainless steel wire was inserted to start the distal movement of the second molars with a compressed Sentalloy coil spring (Fig 6). Within 40 days, the maxillary second molars had been moved about 3.0 mm distally. After being in place for 6 months so as to retain expansion and provide adequate anchorage for the distal movement of the first molars, the RPE was removed and replaced by a transpalatal bar (Fig 7).

Fig 5 (a to d) Intraoral photographs and (e) occlusal radiograph after opening the midpalatal suture with the Hyrax expander.

Fig 6 Intraoral photograph at the initiation of the distal movement of the maxillary second molar.

Fig 7 (a) Intraoral photograph and (b) occlusal view of a study cast after distal movement of the maxillary second molars, which are retained with the inserted transpalatal bar.
A modified Nance appliance was anchored to the maxillary first premolars to provide anchorage for the distal movement of the maxillary first molars. The second premolar brackets were removed and the first molars driven back with a Sentalloy coil spring on a 0.016 × 0.022-inch stainless steel wire. At that stage, a cinched back mandibular 0.016-inch Ni-Ti reverse curve archwire was also inserted. The overjet at this time still measured the initial 5.0 mm (Fig 8).

As the maxillary first molars were moved distally, the second premolars shifted distally spontaneously, leading to an increase space between them and the premolars. Distal driving anchorage loss expressed in mesial movement of the left first premolar and canine was noticed (Fig 9). Thus, a 0.018 × 0.025-inch stainless steel archwire with anterior lingual crown torque and a reverse curve of Spee was tied in the mandibular arch, which was supplemented with Class II elastics.
After moving the first maxillary molars distally, they occluded in a Class I relationship (Fig. 11). At this point, the second and first maxillary molars were tied together and the remaining posterior teeth were gradually moved distally (Fig. 12).

The patient continued to wear her Class II elastics until the canines were in a complete Class I relationship. The maxillary incisors were then retracted as a unit with a 0.018 × 0.025-inch stainless steel wire with a reversed curve of Spee and Class II elastics. Final detailing was achieved with individualized, coordinated 0.018 × 0.025-inch stainless steel archwires. Active treatment ended after 26 months (Fig. 13). The maxillary arch was retained with a wraparound retainer, and a bonded 3-to-3 retainer was placed in the mandibular arch.

RESULTS

All planned treatment objectives and goals were achieved. Maxillary superimposition according to best fit on the palate immediately after distal movement revealed an almost pure translation of the first molars and a mild distal tipping of the second molars (Fig. 14a). The labial crown inclination of the maxillary incisors was mildly increased, which was desirable because they were initially mildly retruded. The mandibular superimposition showed a mesial migration of all teeth (Fig. 14b). This was an expected adverse effect attributed to the use of the Class II elastics. Bone apposition on the frontal surface of the chin was a consequence of normal growth.

The posttreatment cephalometric analysis confirmed no change in the skeletal relationship (Table 1, Fig. 15a). The overall treatment superimposition illustrated that the Class I intercuspation was due to about 2.0 mm distal movement of the maxillary posterior teeth and about 2.0 mm mesial movement of the mandibular teeth (Fig. 15b). The final occlusion, tooth inclination, and root parallelism were all acceptable (Fig. 16).

DISCUSSION

The primary objective of nonextraction treatment of dental Angle Class II patients is distal movement of the maxillary teeth. This can be accomplished with (cervical) headgear in the late mixed or even early permanent dentition if patients are willing to cooperate. This, as well as the absence of the second molars, are two major components for success.

The majority of maxillary distal movement modalities is employed in patients in the late mixed dentition and is designed to act on the first molars. To overcome the resistance of both the first and second maxillary molars, a sophisticated anchorage preparation and a complicated biomechanical force system are required. The respective appliances are often bulky, causing patient discomfort in addition to prolonging treatment time.

The significant distal tipping of the second molars observed here is supported by other studies, according to which unerupted teeth (in this case, the third molars) act as fulcrums. The same studies concluded that translation of both molars was evident when the second molars had completely erupted and the third molars had been extracted.

Sagittal maxillomandibular discrepancies are frequently accompanied by a maxillary constriction, even though a posterior crossbite may not be present in all patients. A skeletal expansion of the maxilla with an RPE is successful even in the long term. Additionally, an RPE produces spontaneous adaptations of the mandible and mandibular dentition. Thus, in the presence of second maxillary molars, an RPE should not only be used for maxillary expansion but also to increase anchorage for the distal movements of the second molars.

Anchorage is of great importance in maxillary molar distal movement appliances. When anchorage is lost, not only will the maxillary molars move distally, but the premolars also shift mesially and the anterior teeth protrude. This could be avoided in the patient presented here because of the RPE, modified Nance appliance, and Class II elastics.
Fig 10  Intraoral photographs at the initiation of Class II elastics wear.

Fig 11  Intraoral photographs after accomplishing a Class I molar relationship.

Fig 12  Sliding mechanics for sequential distal movement of all posterior teeth.

Fig 13  Final extra- and intraoral photographs.
Fig 14  Superimpositions of initial tracings (straight lines) and those immediately after maxillary molar distal movement (dotted lines) for (a) the maxilla and (b) mandible.

Fig 15  (a) Final lateral cephalometric and (b) overall treatment superimposition.

Fig 16  Final panoramic radiograph.
When the crowns of the molars tip significantly during distal movement, bite opening is expected, as is a subsequent increase of the lower anterior facial height. This did not happen in the presented patient as the sliding of the molars occurred on a stiff stainless steel wire.

Distal movement of the maxillary second molars will relapse, especially if the third molars are still in place. To avoid this, their removal was recommended to this patient. The Hyrax expander remained in place to stabilize the skeletal expansion. During this stage of treatment, the RPE appliance on the first molars and premolars served as an excellent anchor unit for the initial distal movement of the second molars.

CONCLUSION

RPEs can be used as reliable anchor units for second molar distalization while using the palate, first molars, and premolars as anchorage for this distalization process. The force can be directly applied to the second molars with a compressed coil spring, so distal tipping is minimized and bite opening avoided.

Remaining third molars should be extracted to avoid relapse.

Miniscrews and miniplates have provided stable anchorage for molar distalization in nonextraction Class II treatment. However, surgical intervention can be frustrating, especially for young patients. This article provides an alternative approach, and future clinical studies could give quantitative information of the efficacy of the method.

REFERENCES


Table 1

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