

Miniscrew-Supported Class III Treatment with the Hybrid RPE Advancer

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Class III malocclusions, irrespective of etiology or patient age, are some of the most complicated problems to treat, with the results often subject to relapse. Attempts to reduce mandibular development with headgear or chin cups¹ have generally been unpredictable. Camouflage mechanics can be unstable due to subsequent spontaneous uprighting of the incisors or late mandibular growth. Consequently, successful Class III treatment frequently requires the early use of functional appliances^{2,3} or reverse-pull facemasks,⁴ in conjunction with rapid palatal expansion (RPE).

The effectiveness of miniscrew-supported palatal expansion for Class III correction has

recently been reported.⁵⁻⁷ Skeletal anchorage helps reduce the unintended buccal tipping of posterior teeth that often occurs with traditional expanders.^{8,9} Skeletally anchored facemasks have also been shown to produce more effective midface protraction,¹⁰ although the procedures are somewhat invasive.

Baccetti and colleagues^{11,12} and others¹³⁻¹⁵ have described an effective combination of palatal expansion with maxillary protraction to enhance maxillary advancement. It seems likely that the addition of miniscrew anchorage would be beneficial in reducing adverse dental side effects^{14,15} and enhancing the skeletal effects of protraction and expansion. To that end, Dr. Wilmes has designed



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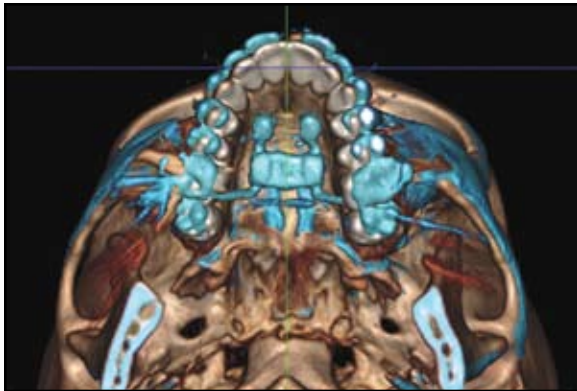


Fig. 1 Superimposed pre- and post-expansion CT scans of patient treated with Hybrid RPE Advancer and facemask protraction, registered at sella-nasion. Appliance combination resulted in both transverse expansion and maxillary advancement.

a Hybrid RPE Advancer, which uses palatal miniscrews for anchorage during expansion and advancement of the maxilla in Class III adolescent patients who were not treated earlier (Fig. 1).

Appliance Fabrication

1. Place two miniscrews (Ortho Easy,* 8mm × 1.7mm) in the anterior palate, about 8mm behind the papilla incisiva. (The technique was originally designed using Benefit** miniscrew system components,⁸ but other miniscrews designed for pala-

*Forestadent, 2315 Weldon Parkway, St. Louis, MO 63146; www.forestadent.com. Snap Lock is a registered trademark.

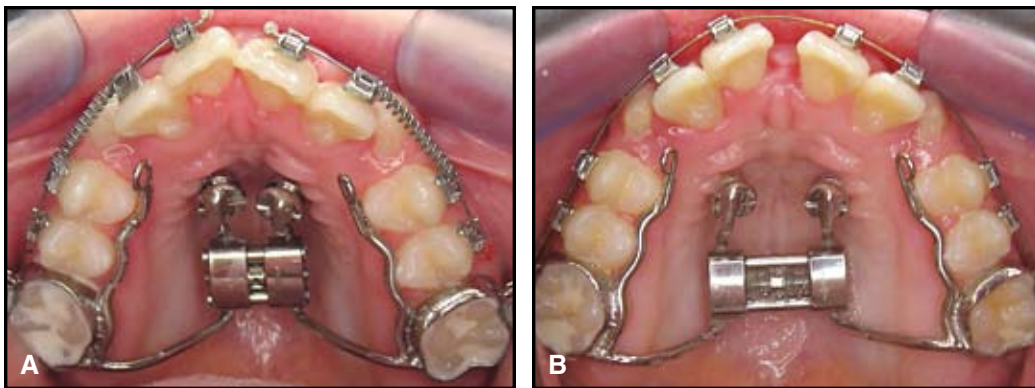


Fig. 2 A. Hybrid RPE Advancer before activation. Two miniscrews are inserted into anterior palate; laboratory abutments “keyed” to miniscrews anchor Hyrax expansion screw and provide support for facemask protraction. B. Significant maxillary expansion after 12 days of RPE activation.



Fig. 3 Pre- and post-activation frontal cephalometric radiographs and superimposed CT scans, demonstrating significant transverse skeletal expansion (7.2mm in 12 days) with minimal dental tipping.

tal use are also appropriate.)

2. Fit bands to the upper first molars and attach laboratory abutments to the miniscrew heads.
3. Take a pickup impression of the maxillary arch.
4. Fabricate the Hyrax expansion unit from a Snap Lock* expansion screw by soldering wire segments between the screw and the upper first molar bands. Add wire segments along the palatal surfaces of the buccal teeth, annealing the terminal ends and then bending the ends into hooks for attachment of reverse-pull facemask elastics.
5. Snap abutments over the palatal miniscrews, securing them with ligature ties if desired.
6. Try the appliance in the mouth before luting it with glass ionomer cement (Fig. 2A).

Clinical Management

After delivery of the appliance, the expansion screw is activated three times a day for 12-14 days

**PSM Medical Solutions, Moltkestrasse 41, 78532 Tuttlingen, Germany; www.psm.ms.

(Fig. 2B), with the results evaluated weekly. A maxillary midline diastema should appear after about three days; overexpansion is advisable due to anticipated relapse. Significant transverse expansion of the maxilla can be anticipated, without any substantial buccal tipping of the posterior dentition (Fig. 3).

Maxillary protraction is initiated immediately after active palatal expansion. A Delaire facemask is prescribed for full-time wear, using ¼", 6oz elastics (sometimes 12oz) extending cross-wise from the lingual arms on the expander—in other words, the left side of the expander is attached to the right side of the facebow (Fig. 4)—and thus generating a caudal vector of force. Full fixed preadjusted appliances can be applied concurrently with the start of expansion or protraction to initiate leveling and alignment of the dental arches.

In effect, the Class III malocclusion is resolved by miniscrew-supported protraction, without unstable anterior dental compensation (Fig. 5). Proper angulation of the upper and lower incisors

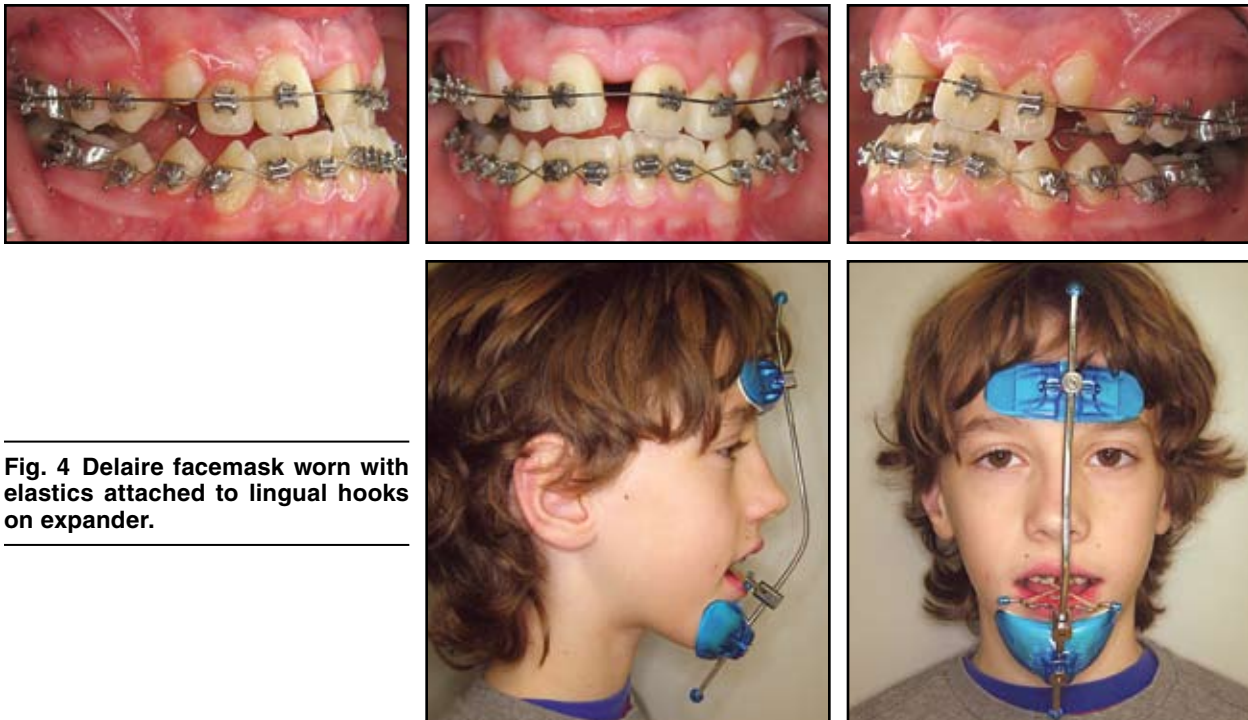


Fig. 4 Delaire facemask worn with elastics attached to lingual hooks on expander.

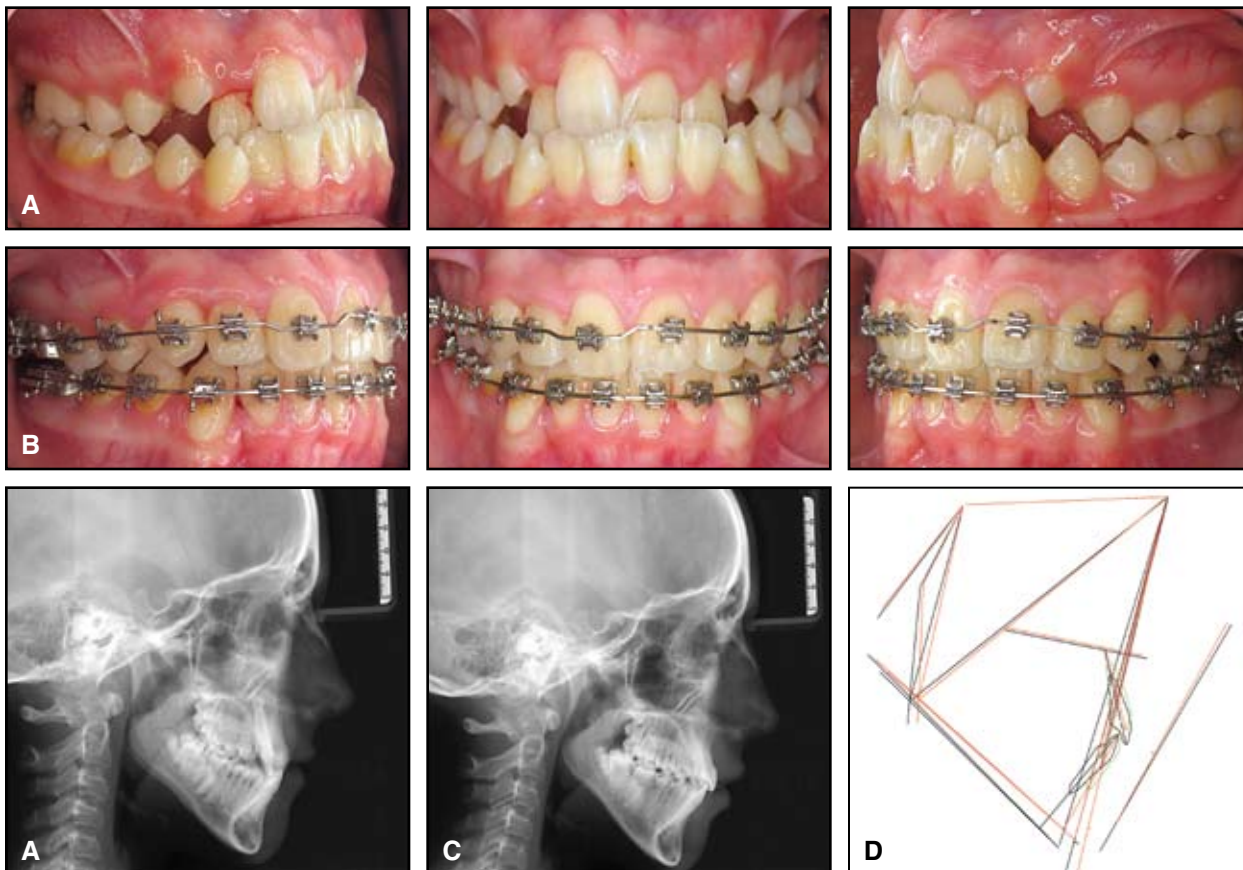


Fig. 5 A. Patient before treatment with Hybrid RPE Advancer. B. Progress after 12 months. C. Post-treatment lateral radiograph. D. Superimposition of pretreatment (red/green) and post-treatment (black) cephalometric tracings.

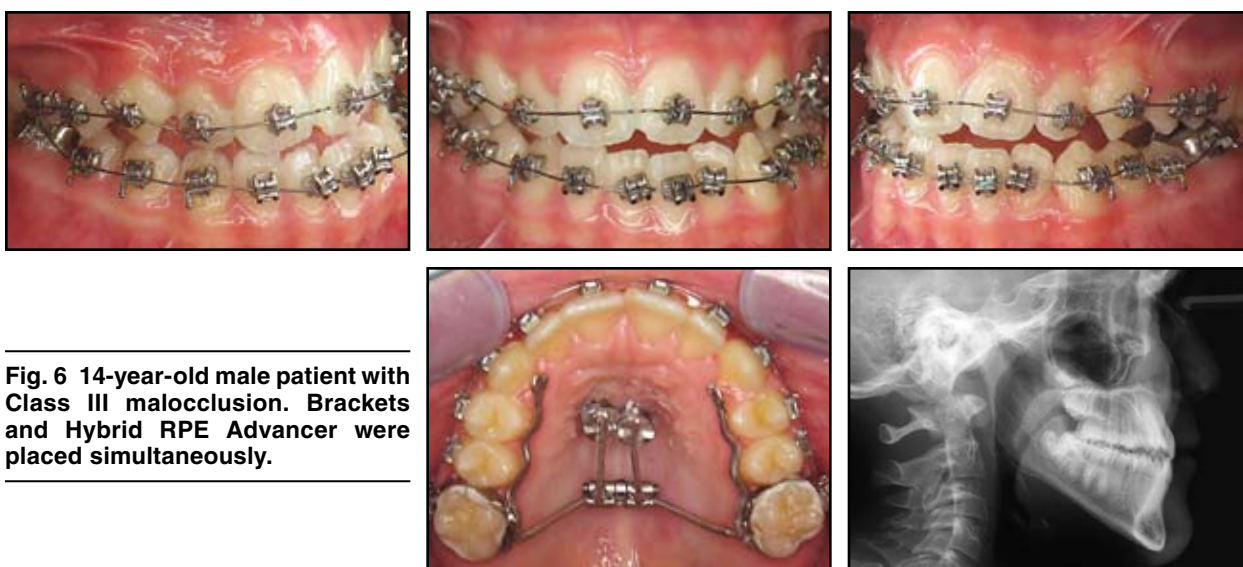


Fig. 6 14-year-old male patient with Class III malocclusion. Brackets and Hybrid RPE Advancer were placed simultaneously.

will be achieved as maxillary protraction progresses. The results should therefore be more stable than those of conventional camouflage strategies.

Case Report

A 14-year-old male presented with a Class III malocclusion caused by transverse and sagittal hypoplasia of the maxilla with subsequent development of a negative overjet (Fig. 6).

Orthodontic brackets and the Hybrid RPE Advancer were placed simultaneously. The patient was instructed to activate the palatal expander

three times daily. After 14 days, substantial correction of the transverse discrepancy had been achieved (Fig. 7A). Subsequently, the patient wore a Delaire facemask full-time for 10 weeks of maxillary protraction (Fig. 7B). Typical edgewise mechanics were then continued for another nine months.

After 12 months of treatment, the patient showed a Class I occlusion (Fig. 8A). Superimposition of the pre- and post-treatment cephalometric tracings showed the significant effects of maxillary growth and facemask protraction (Fig. 8B). We noted no adverse labial flaring of the



Fig. 7 A. Transverse correction after 14 days of palatal expansion. B. Improvement after 10 weeks of treatment with continuous-protraction facemask.

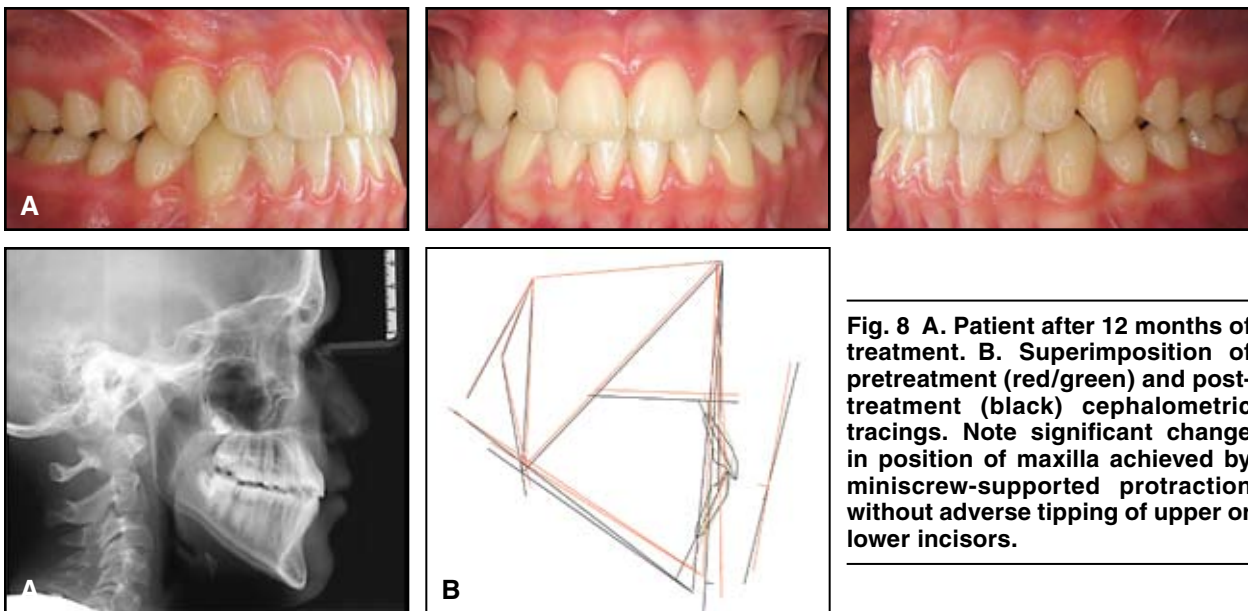


Fig. 8 A. Patient after 12 months of treatment. B. Superimposition of pretreatment (red/green) and post-treatment (black) cephalometric tracings. Note significant change in position of maxilla achieved by miniscrew-supported tipping protraction without adverse tipping of upper or lower incisors.



Fig. 9 Patient after two years of retention with removable appliances.

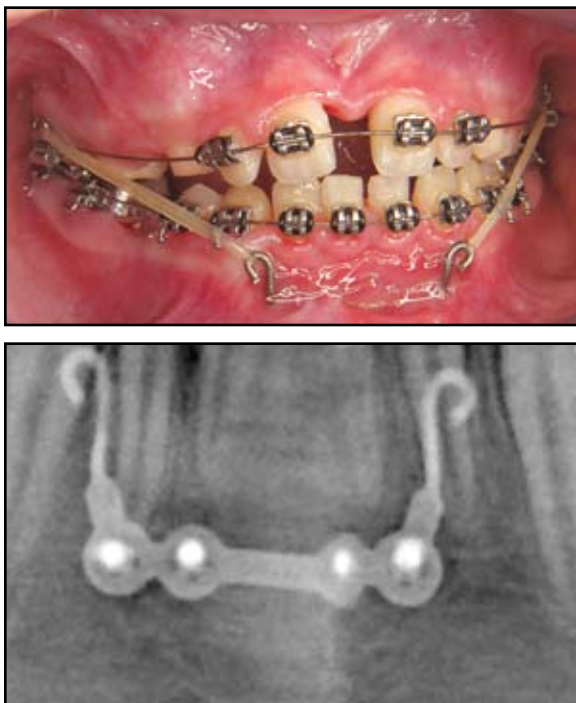


Fig. 10 "Mentoplate" (developed by Dr. Drescher), anchored with four miniscrews in anterior region of mandible, allows attachment of elastics from transgingival hooks to upper first molars for protraction without extraoral device.

maxillary incisors or lingual tipping of the mandibular anterior teeth. These results remained stable two years later with the use of removable retainers (Fig. 9).

Discussion

The miniscrew-supported Hybrid RPE Advancer, combined with a reverse-pull facemask, provides an alternative treatment method for resolution of moderate Class III malocclusions. Transverse expansion and protraction of the maxilla supported by miniscrew anchorage can avoid both the unstable flaring of the upper incisors and the lingual tipping of the lower anterior teeth commonly associated with camouflage methods, without inhibiting mandibular growth. It also appears that the results may be more stable, although additional studies are needed in this area.

Recent work by Heymann and colleagues shows effective maxillary protraction with elastics to miniplates.¹⁶ Wilmes and colleagues suggest that the miniscrew-supported Hybrid RPE Advancer may be used in conjunction with miniplates placed in the anterior portion of the mandible (Fig. 10).¹⁷ After expansion of the upper arch, intermaxillary

elastics are attached from the upper molar bands to hooks on the miniplates, thus avoiding the unesthetic appearance of a cumbersome extraoral protraction device. We are performing further research on this procedure.

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REFERENCES

1. Deguchi, T.; Kuroda, T.; Minoshima, Y.; and Graber, T.M.: Craniofacial features of patients with Class III abnormalities: Growth-related changes and effects of short-term and long-term chin cup therapy, *Am. J. Orthod.* 121:84-92, 2002.
2. Baik, H.S.; Jee, S.H.; Lee, K.J.; and Oh, T.K.: Treatment effects of Frankel functional regulator III in children with class III malocclusions, *Am. J. Orthod.* 125:294-301, 2004.
3. Levin, A.S.; McNamara, J.A. Jr.; Franchi, L.; Baccetti, T.; and Frankel, C.: Short-term and long-term treatment outcomes with the FR-3 appliance of Frankel, *Am. J. Orthod.* 134:513-524, 2008.
4. Kapust, A.J.; Sinclair, P.M.; and Turley, P.K.: Cephalometric effects of face mask/expansion therapy in Class III children: A comparison of three age groups, *Am. J. Orthod.* 113:204-212, 1998.
5. Harzer, W.; Schneider, M.; and Gedrange, T.J.: Rapid maxillary expansion with palatal anchorage of the hyrax expansion screw—pilot study with case presentation, *J. Orofac. Orthop.* 65:419-424, 2004.
6. Garib, D.G.; Navarro, R.L.; Francischone, C.E.; and Oltramari, P.V.: Rapid maxillary expansion using palatal implants, *J. Clin. Orthod.* 42:665-671, 2008.
7. Ludwig, B.; Glasl, B.; Zorkun, B.; Wilmes, B.; Kinzinger, G.; and Lisson, J.: Rapid maxillary expansion with skeletal force: The Hybrid RPE, *Kieferorthop.* 23:267-274, 2009.
8. Wilmes, B. and Drescher, D.: A miniscrew system with interchangeable abutments, *J. Clin. Orthod.* 42:574-580, 2008.
9. Wilmes, B.: Fields of application of mini-implants, in *Mini-Implants in Orthodontics: Innovative Anchorage Concepts*, ed. B. Ludwig, S. Baumgaertel, and S.J. Bowman, Quintessence Publishing, London, 2008, pp. 91-122.
10. Kircelli, B.H. and Pektas, Z.Ö.: Midfacial protraction with skeletally anchored face mask therapy: A novel approach and preliminary results, *Am. J. Orthod.* 133:440-449, 2008.
11. Baccetti, T.; Franchi, L.; and McNamara, J.A. Jr.: Treatment and posttreatment craniofacial changes after rapid maxillary expansion and facemask therapy, *Am. J. Orthod.* 118:404-413, 2000.
12. Baccetti, T.; Franchi, L.; and McNamara, J.A. Jr.: Cephalometric variables predicting the long-term success or failure of combined rapid maxillary expansion and facial mask therapy, *Am. J. Orthod.* 126:16-22, 2004.
13. Smith, S.W. and English, J.D.: Orthodontic correction of a Class III malocclusion in an adolescent patient with a bonded RPE and protraction face mask, *Am. J. Orthod.* 116:177-183, 1999.
14. Gautam, P.; Valiathan, A.; and Adhikari, R.: Skeletal response to maxillary protraction with and without maxillary expansion: A finite element study, *Am. J. Orthod.* 135:723-728, 2009.
15. Vaughn, G.A.; Mason, B.; Moon, H.B.; and Turley, P.K.: The effects of maxillary protraction therapy with or without rapid palatal expansion: A prospective, randomized clinical trial, *Am. J. Orthod.* 128:299-309, 2005.
16. Heymann, G.C.; Cevidanes, L.; Cornelis, M.; De Clerck, H.J.; and Tulloch, J.F.: Three-dimensional analysis of maxillary protraction with intermaxillary elastics to miniplates, *Am. J. Orthod.* 137:274-284, 2010.
17. Wilmes, B.; Nienkemper, M.; and Drescher, D.: Application and effectiveness of a new mini-implant and tooth-borne rapid palatal expansion device, *World J. Orthod.*, in press.