

## Nonextraction Treatment in the Mixed Dentition

[DAN COUNIHAN, BDS, FDS, FFD, MOrth, DDO](#)

Better facial and dental esthetics can be achieved in many patients by avoiding midarch extractions.<sup>1-4</sup> Since the nose and chin tend to grow faster than the dentoalveolar area in the early to late teen-age years,<sup>5</sup> it may be advantageous to leave the treated dentition slightly protrusive. In fact, a protrusive appearance with greater lip eversion is now more popular than in the past.<sup>6,7</sup> Furthermore, the width of the smile may not be esthetically pleasing after extractions, and a second premolar, which generally has a shorter and narrower crown than a first premolar, often looks too small next to a large canine.

Mid-arch extractions may necessitate more bodily retraction of the incisors, with the risk of root resorption and of reopening of the extraction spaces. In addition, if the third molars eventually need to be extracted, the patient will be left with only 24 permanent teeth.

Many orthodontists prefer to treat patients in the mixed dentition, primarily because of better compliance.<sup>8-10</sup> Treatment can be started sooner if the clinician does not have to wait for the premolars to erupt and to be extracted. Leeway space can be used to advantage in the mixed dentition,<sup>11</sup> so that maxillary first molars can be derotated and distalized before the eruption of the second molars. Spontaneous drift is also more effective in the developing dentition, and functional appliances can be used during a period of favorable growth.

For these reasons, it is now common for general dentists to send their patients for their first orthodontic examinations at the age of 7 1/2 to 9 1/2. Dental age can vary greatly from chronological age, and eruption patterns can differ even among members of the same family. Early examination allows the orthodontist to choose between one- and two-phase treatment and to time the initiation of treatment to suit the particular malocclusion.

This article shows four patients with various orthodontic problems who were all treated in the mixed dentition without extractions.

### Case 1

A 10-year-old female presented with a slightly convex profile, good lip support, a nice smile, and an upper midline deviated slightly to the left (Fig. 1, Table 1). She had crowding in both arches; the right buccal segment was Class II, and the left was one-half unit Class II. The mandibular left second deciduous molar had been lost prematurely, and the first permanent molar had tipped mesially, causing the second premolar to become impacted.

To achieve the best facial and dental results and to comply with her mother's wishes, I opted to treat the patient without extractions. The four first molars were banded, and a lower lip bumper was placed to upright the mandibular left first molar and capture the leeway space from the right deciduous molar. Every six weeks, the lip bumper was activated 1mm forward of the mandibular incisors' gingival margin. After 11 months, there was enough space to align the mandibular arch (Fig. 2). The lip bumper was left in place for anchorage.

In the maxillary arch, a removable palatal bar corrected the mesial molar rotations within four months. For eight months, the patient wore headgear 12 hours per day and a removable appliance

with finger springs to the maxillary first molars 24 hours per day (Fig. 2). The maxillary first premolars were then banded, the removable appliance was discontinued, and the palatal bar was modified into an anchorage unit. Intra-arch elastics from the first molars to the first bicuspids were worn with the headgear to enhance the distal drift of the first bicuspids (Fig. 3).

Preadjusted .022" appliances with Roth prescription were placed after 11 months of treatment in the mandibular arch and after 15 months in the maxillary arch. Archwires progressed from .014" Sentalloy to .021" × .025" stainless steel in the mandibular arch and .019" × .025" stainless steel in the maxillary arch.

The midline was fully corrected with an elastic from the cuspid hook on the right of the Kloehn facebow to the maxillary left central incisor, along with a nickel titanium compressedcoil spring in the region of the maxillary right canine (Fig. 4). Once sufficient space had been opened for the canine, final settling was accomplished with a maxillary .019" × .025" Quadcat wire and interarch elastics (Fig. 5).

Active appliances were removed after 31 months of treatment (Fig. 6). Maxillary and mandibular retainers were worn full-time for six months and then at night only. The patient is still under observation, and the mandibular second molars may need to be uprighted in the future.

## Case 2

An 11-year-old female presented with a Class II, division 2 malocclusion, a long lower face, a retrusive chin and dentition, a flat profile, and a weak smile (Fig. 7). She had poor lip support, as evidenced by a reduced display of upper and lower vermillion at rest. The molar occlusion was Class I and the overjet was normal, but the overbite was deep and complete. The patient had severe crowding in both arches, with a mandibular arch-length discrepancy of 10mm.

Radiographic analysis indicated that the canines were all extremely short of space. Cephalometric analysis showed a 78° angle of the mandibular incisors to the mandibular plane, a 36° Frankfort-mandibular plane angle, and the lips at -5mm to the Ricketts E-line (Table 2).

Because of the poor facial esthetics and lack of lip support, I decided to treat the patient without extractions. A lower lip bumper was reactivated every six weeks by moving the labial wire 1mm forward of the gingival margin of the mandibular incisors. A maxillary palatal bar was reactivated periodically for four months to correct the mesial first molar rotations. A Ten Hoeve-type appliance was then placed to distalize the maxillary first molars into an overcorrected Class I relationship. Headgear was worn 12 hours per night.

After five months, the maxillary removable appliance was discontinued, the palatal bar was remade into an anchorage unit, and the patient was instructed to wear the headgear only while sleeping. After 18 months of total treatment, there was enough arch development to accommodate all permanent teeth, from first molar to first molar, in both arches (Fig. 8).

Full fixed appliances were placed at this stage, and erupting teeth were gradually bonded and brought into the arches. The patient's dental development was slow, so that the fixed appliance phase took 26 months (Fig. 9). Post-treatment cephalometric analysis showed considerable uprighting of the dentition, with the mandibular incisors proclined to a more normal 85° to the mandibular plane.

## Case 3

This patient presented at age 9 years, 8 months, because his mother was concerned about his protruding teeth and the possibility of trauma. He had a broad face and a retrusive mandible, with the lower lip trapped behind the maxillary incisors and a deep labiomental fold (Fig. 10).

The molar relationship was a full Class II on the right and a half-unit Class II on the left. The lower left first deciduous molar had been extracted previously, and the second deciduous molar and first permanent molar had drifted mesially to occupy about half the extraction space. The mandibular midline was deviated to the left. The patient had good-size arches, but a shortage of space in the mandibular left canine region.

Cephalometric analysis revealed a Class II skeletal base (ANB 7°) and proclined maxillary incisors (Table 3).

I decided to use a Clark twin-block appliance because of the patient's retrusive mandible and severe overjet. After 11 months of wear, a holding appliance was worn for an additional five months. At this point, the overjet had been reduced to 6mm (Fig. 11).

The four first molars were banded, and a palatal bar and lip bumper were fitted. The maxillary first molar rotations were corrected in five months, after which the molars were distalized with headgear, worn 12 hours per day, and a removable appliance with finger springs, worn 24 hours per day (Fig. 12). To prevent proclination of the maxillary incisors, light elastics were worn for five months from the cuspid hooks on the Kloehn facebow, passing incisally to the plastic on the labial bow.

The lower lip bumper was used for 10 months to capture leeway space for the crowded left canine and to correct the midline (Fig. 13). The palatal bar was then refitted as an anchorage unit, the lip bumper was left in place for anchorage, and the patient was told to wear the headgear at night only.

Preadjusted .022" appliances with Roth prescription were bonded in both arches, while medium elastics were worn across the cuspid hooks to retract and intrude the maxillary incisors. Intra-arch elastics from the maxillary first molars to the canines (and later to soldered hooks) were worn with the headgear to retract the anterior teeth and conserve anchorage (Fig. 14).

Full torque was expressed with .021" × .025" wires in both arches; the final maxillary archwire was .019" × .025" Quadcat. Interarch elastics were used to settle the occlusion and achieve good interdigitation.

A pleasant dental and facial appearance was achieved after 22 months of fixed appliance therapy (Fig. 15). Maxillary and mandibular retainers were worn full-time for six months and then at night only.

#### **Case 4**

A female patient presented for her first orthodontic consultation at age 7 years, 10 months. Her mother was concerned about her crowded and protruding teeth; there was a family history of this type of malocclusion. She had a protrusive dentition with poor lip competence and a slightly convex profile (Fig. 16). The buccal occlusion was a full Class II, the overjet was 11mm, and the overbite was excessive but not complete.

Both arches were narrow, and the mandibular incisors were crowded. The permanent incisors and first molars had erupted; the radiograph showed all teeth except the third molars. Cephalometric

analysis revealed a strong skeletal Class II base and severe proclination of the maxillary incisors (Table 4).

In Phase I, a twin block was used to promote mandibular growth and reduce the overjet. After 13 months of good cooperation, the overjet had been reduced to 4mm. A holding appliance was then worn at night for 14 months, after which no appliances were worn for 12 months.

Phase II was begun at age 11 years, 4 months (Fig. 17). A palatal bar was worn for four months to correct the mesial maxillary molar rotations (Fig. 18). A maxillary removable appliance, supported by headgear, was then worn for 11 months to distalize the molars (Fig. 19). A lower lip bumper was placed to capture leeway space and encourage passive uprighting of the buccal segments.

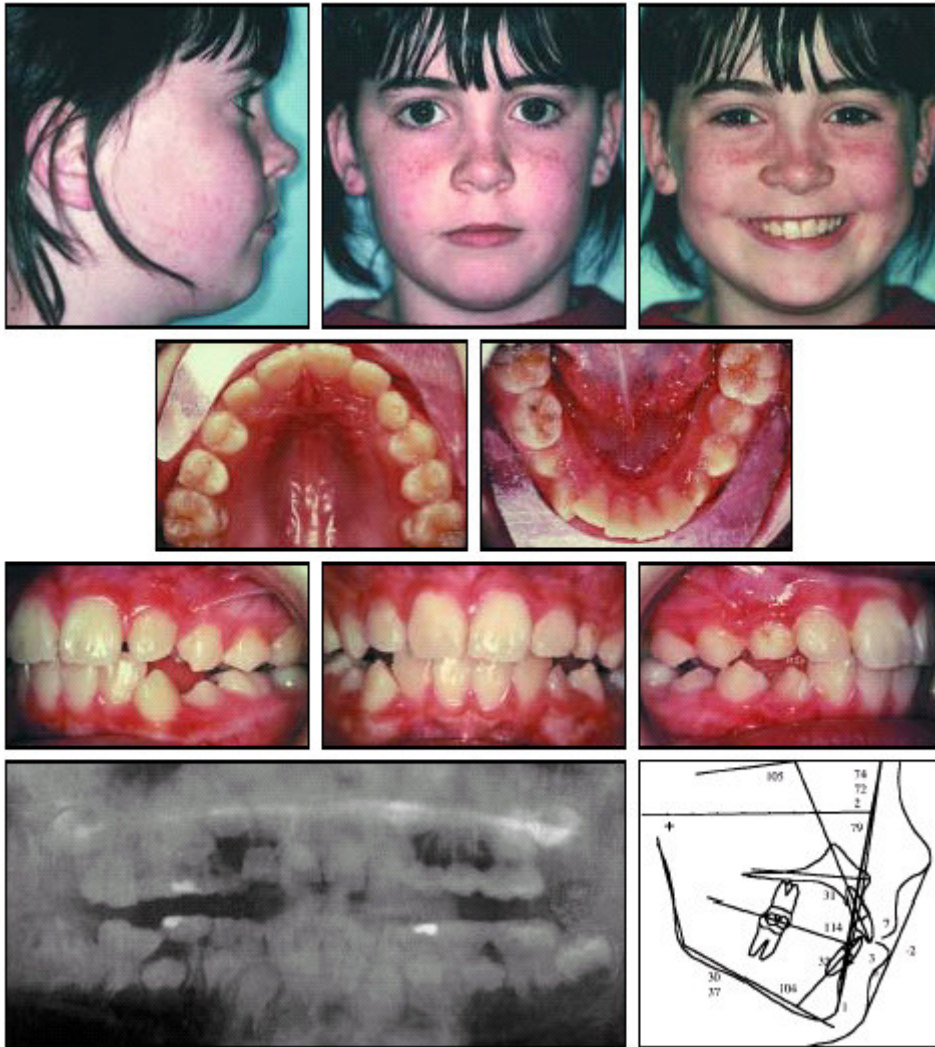
The Adams clasps were removed from the maxillary removable appliance to allow spontaneous distal drifting of the buccal segments. After 12 months of Phase II therapy, the removable appliance was discontinued, and the palatal bar was refabricated as an anchorage unit. Headgear wear was reduced to sleeping hours.

After 11 months of Phase II, the mandibular arch was bonded with a preadjusted Roth appliance. While the lip bumper was continued for anchorage, mandibular archwires progressed to .021" × .025" stainless steel.

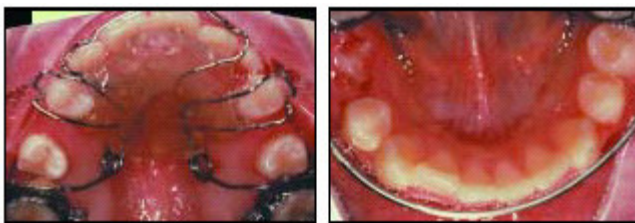
The maxillary incisors were bonded after 14 months of Phase II. The maxillary cuspids and bicuspid were bonded after another seven months (Fig. 20). The overjet was substantially reduced with intra-arch elastics from the first molars to the soldered hooks distal to the lateral incisors (worn only with the headgear). The incisors were retracted and intruded with elastics across the cuspid hooks on the Kloehn facebow. There was minimal frictional resistance to the overjet reduction, with no strain on anchorage.

Nine months later, all fixed appliances were removed, and retainers were delivered (Fig. 21). □

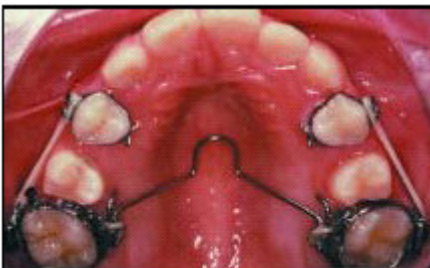
## FIGURES



**Fig. 1** Case 1. 10-year-old female with crowding in both arches before treatment.



**Fig. 2** Case 1. After 11 months of wearing mandibular lip bumper and eight months of maxillary removable appliance.



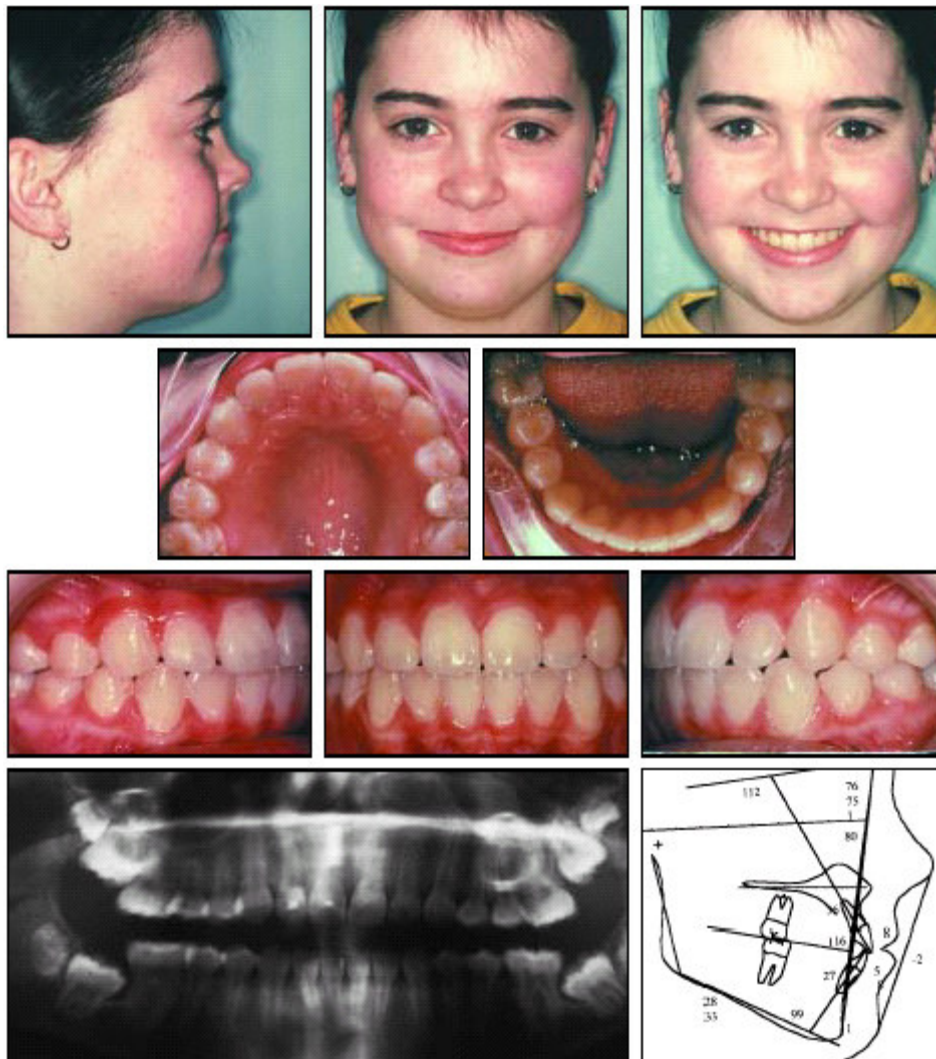
**Fig. 3** Case 1. Intra-arch elastics from first molars to first bicuspids, worn with headgear to enhance distal drift of first bicuspids.



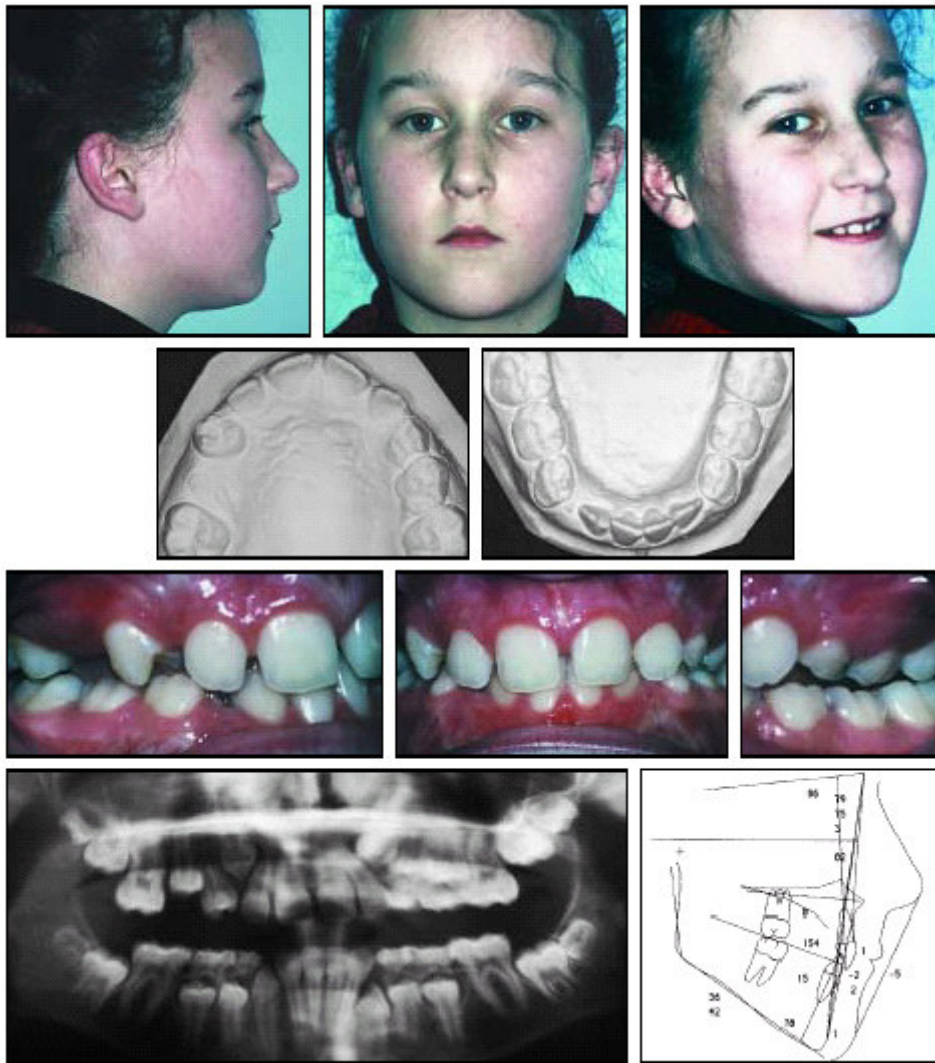
**Fig. 4** Case 1. Elastic from cuspid hook on facebow to maxillary left central incisor and nickel titanium compressed-coil spring in area of maxillary right canine used for midline correction.



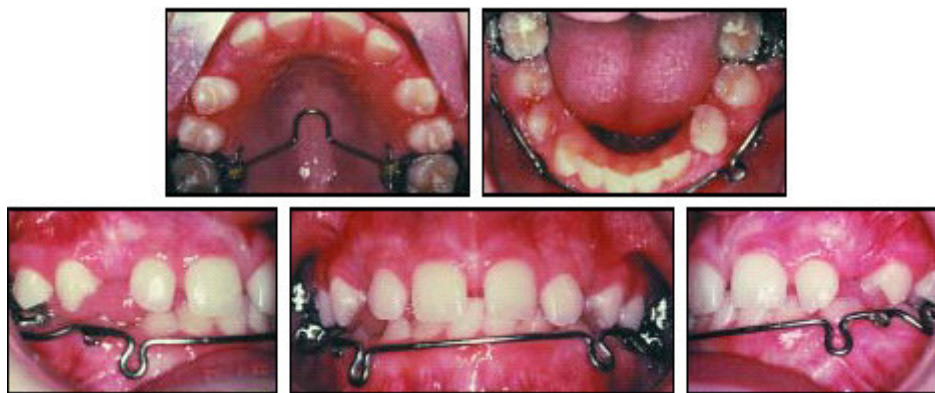
**Fig. 5** Case 1. Finishing with maxillary .019" × .025" Quadcat wire and interarch elastics.



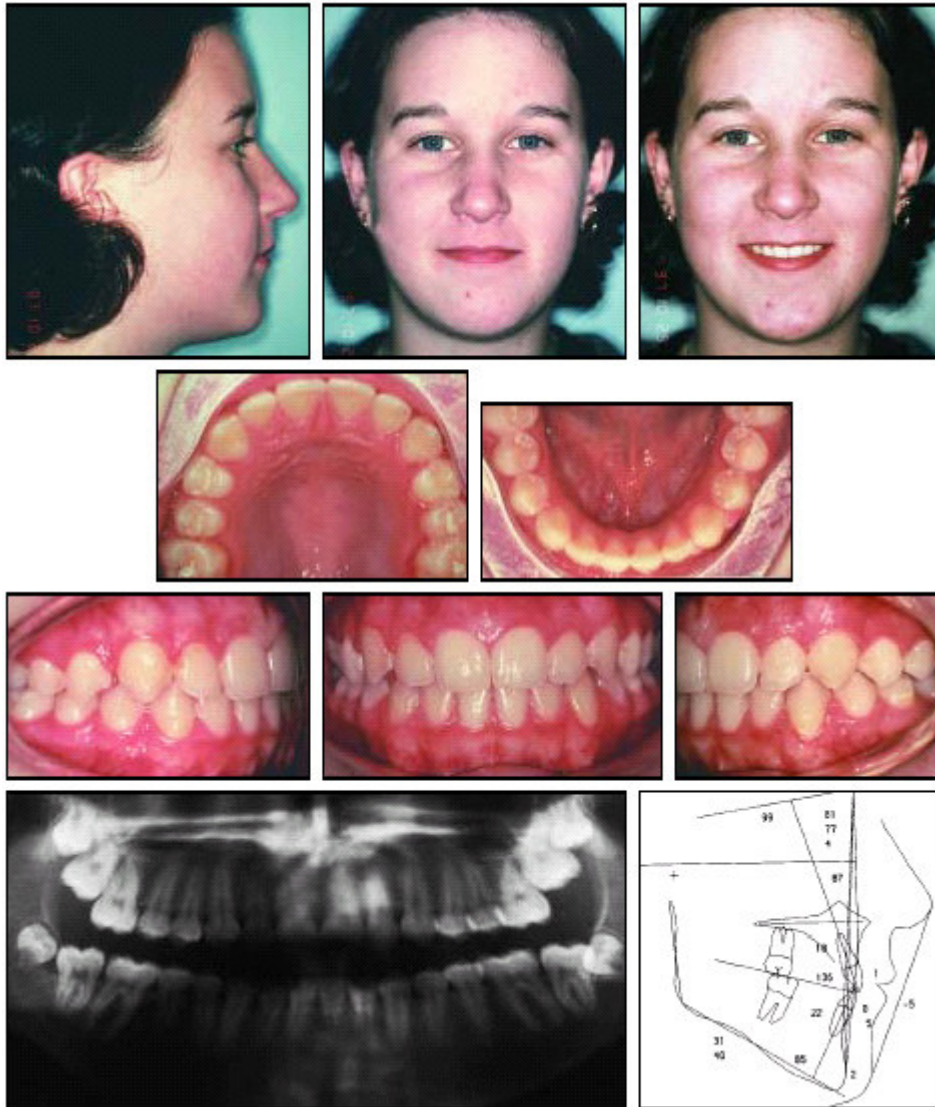
**Fig. 6** Case 1. After 31 months of total treatment.



**Fig. 7** Case 2. 11-year-old female with Class II, division 2 malocclusion before treatment.

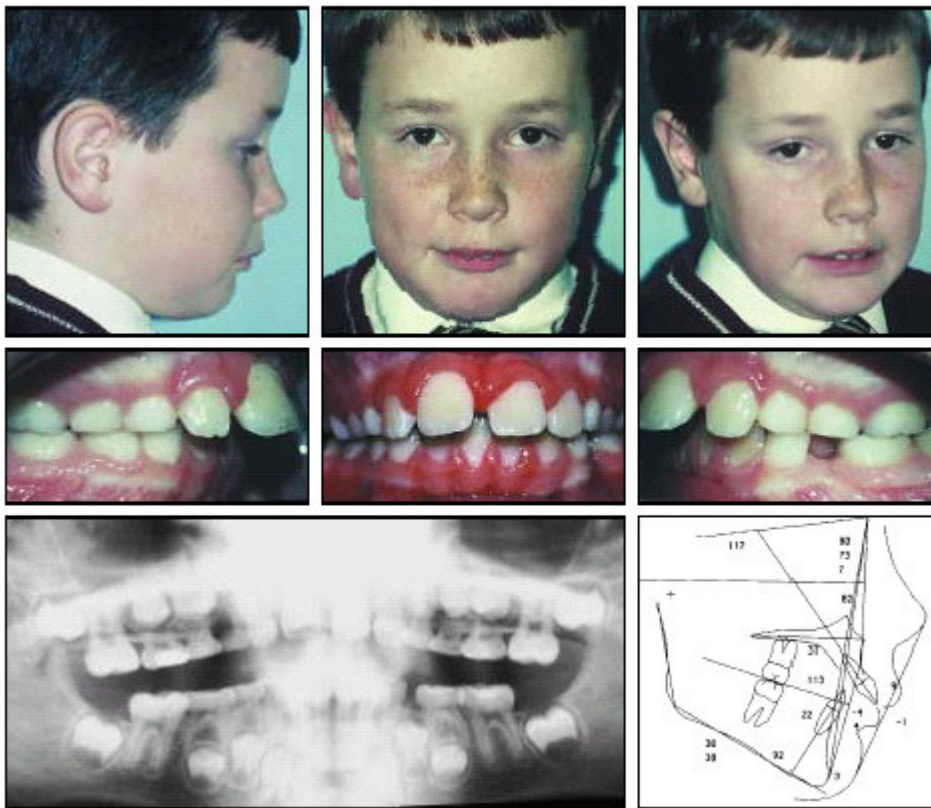


**Fig. 8** Case 2. After 18 months of treatment.



**Fig. 9** Case 2. After 26 months of fixed appliance treatment.

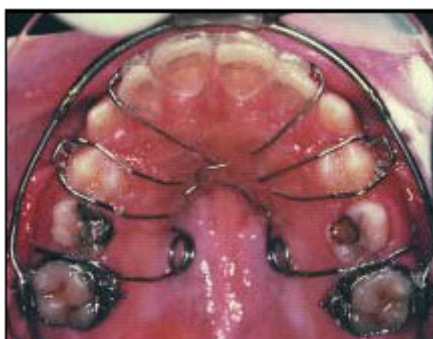




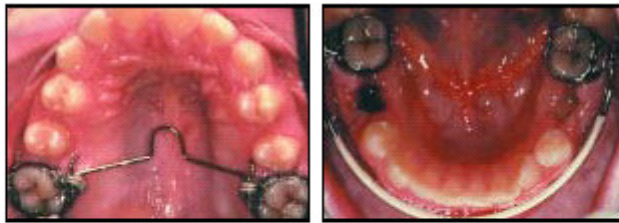
**Fig. 10** Case 3. 9-year-old male with skeletal Class II malocclusion before treatment.



**Fig. 11** Case 3. After 11 months of twin-block appliance therapy.



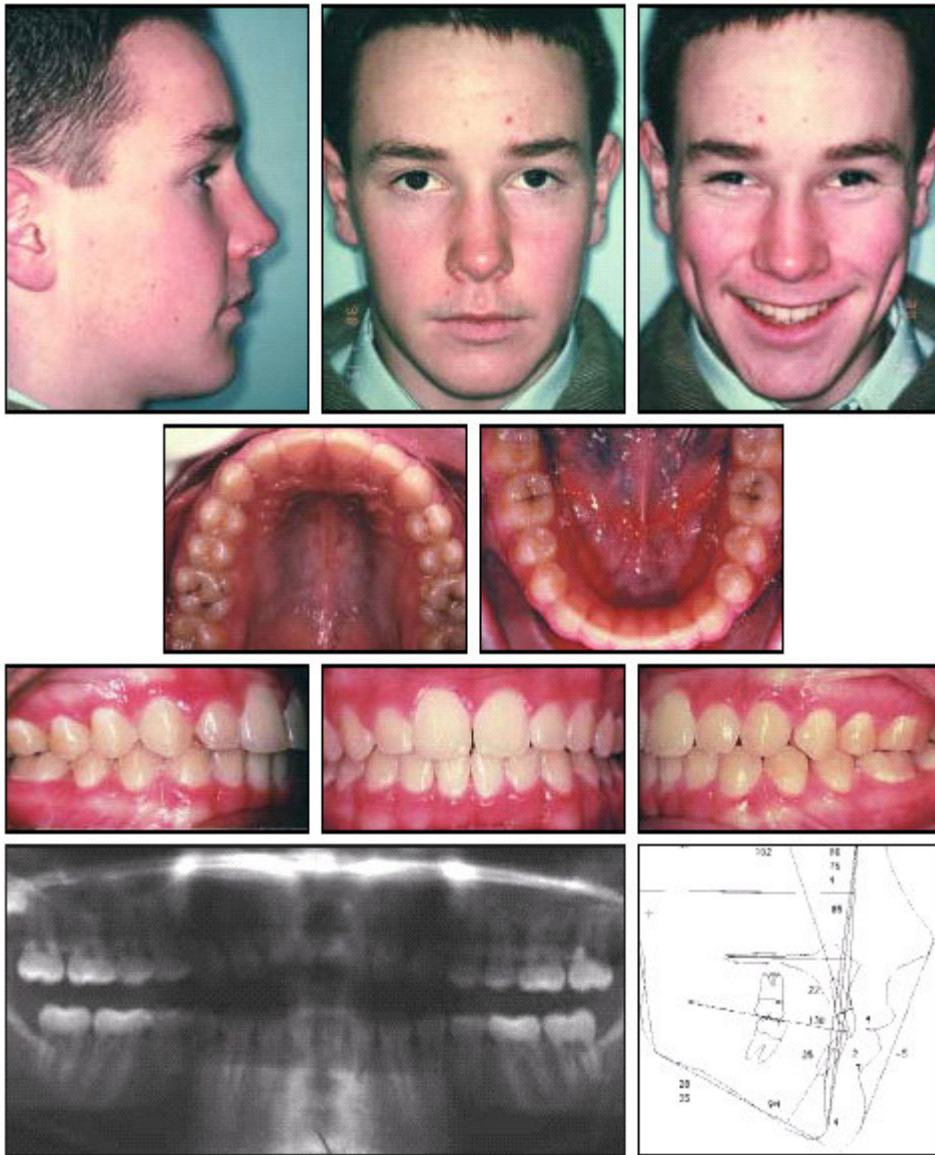
**Fig. 12** Case 3. Distalization of maxillary molars with headgear and removable appliance with finger springs.



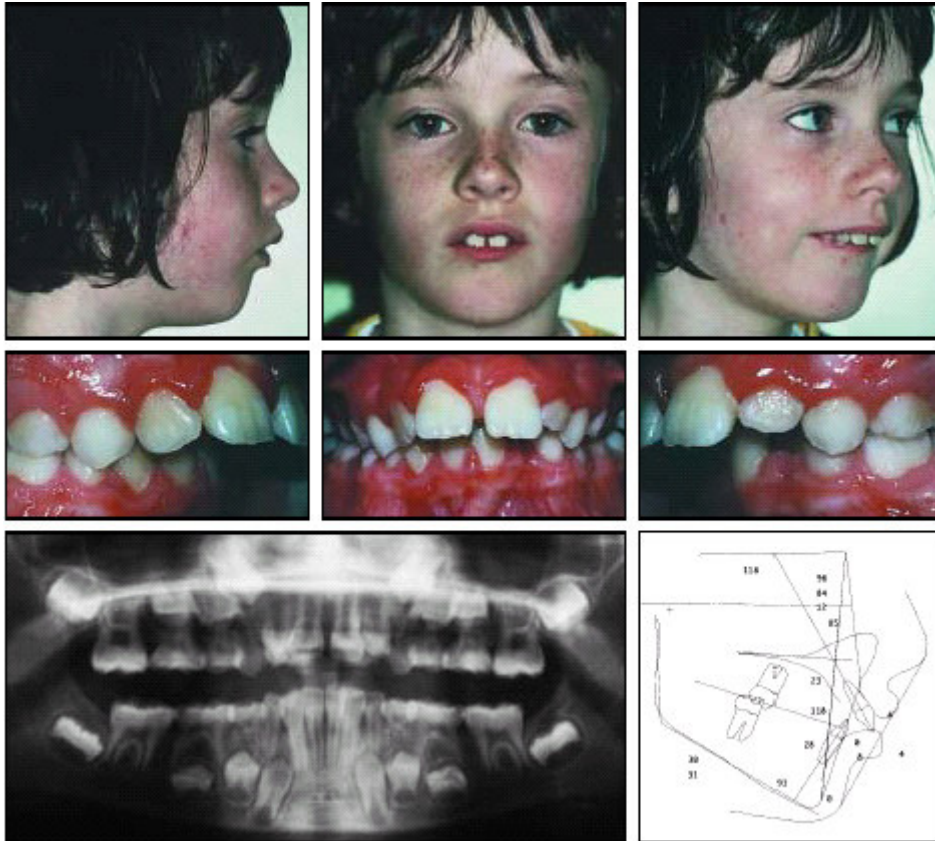
**Fig. 13** Case 3. After 10 months of using lower lip bumper to capture leeway space for crowded left canine and to correct midline; palatal bar refitted as anchorage unit.



**Fig. 14** Case 3. Preadjusted .022" appliances combined with medium elastics across cuspid hooks and intraarch elastics from maxillary first molars to canines.



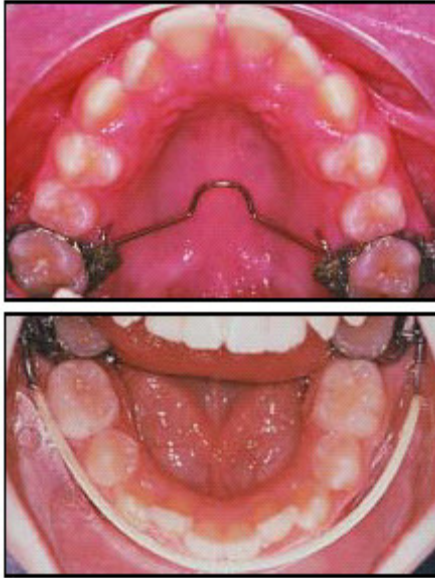
**Fig. 15** Case 3. After 22 months of fixed appliance therapy.



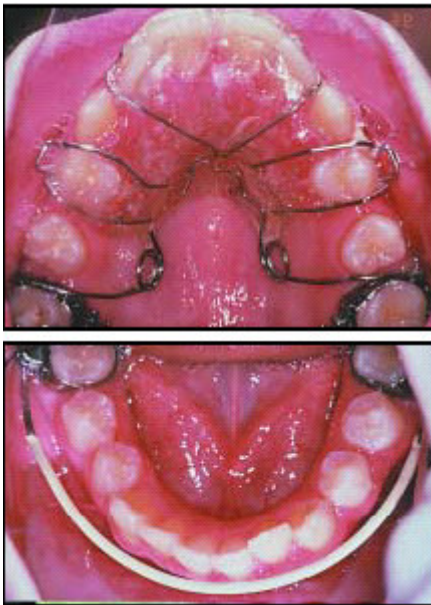
**Fig. 16** Case 4. 7-year-old female with skeletal Class II malocclusion before treatment.



**Fig. 17** Case 4. Patient at beginning of Phase II, at age 11.



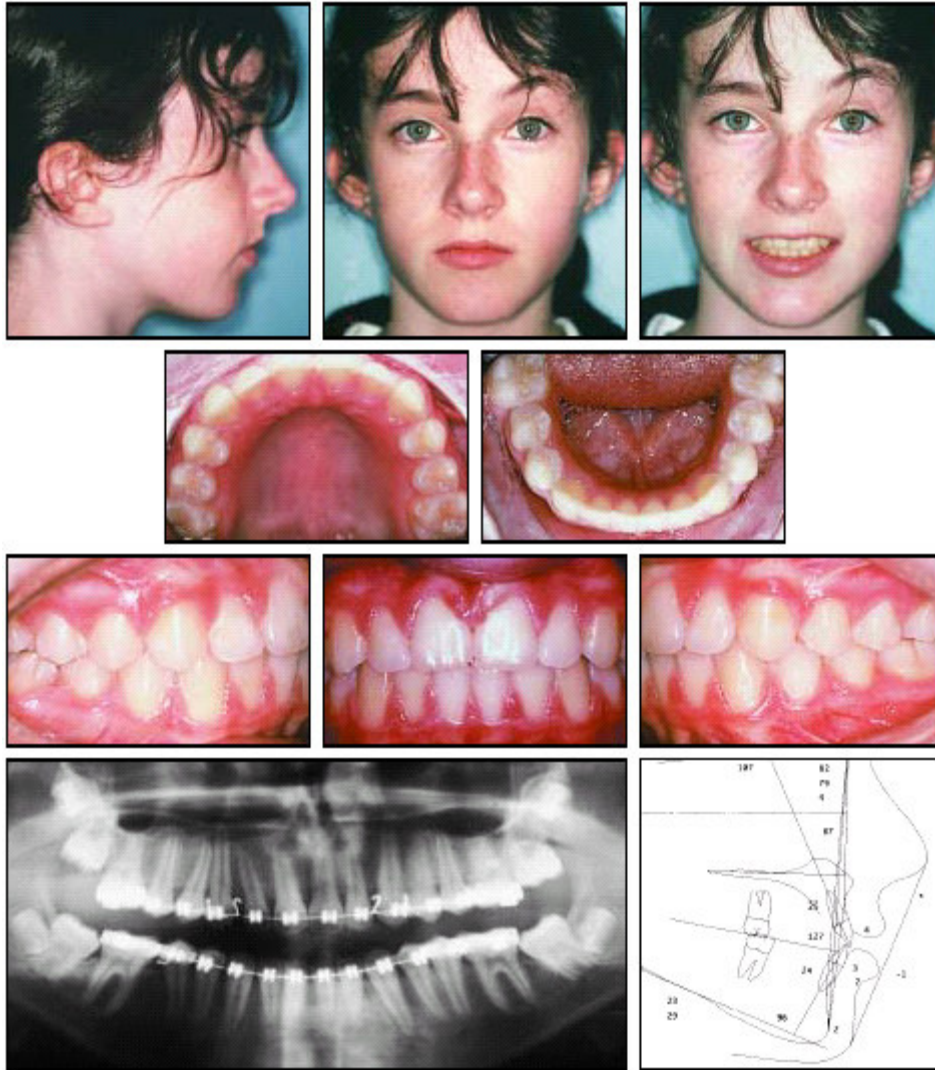
**Fig. 18** Case 4. Palatal bar used to correct mesial maxillary molar rotations; lower lip bumper used to capture leeway space and encourage passive uprighting of buccal segments.



**Fig. 19** Case 4. Maxillary removable appliance and headgear used to distalize molars.



**Fig. 20** Case 4. Maxillary cuspids and bicuspid bonded after 21 months of Phase II therapy. Overjet reduced with intra-arch elastics from first molars to soldered hooks distal to lateral incisors; incisors retracted and intruded with elastics across cuspid hooks on Kloehn facebow.



**Fig. 21** Case 4. After 30 months of Phase II therapy

**TABLES**

**TABLE 1**  
**CASE 1: IOWA ANALYSIS**

	Initial	Norm	Clin. Dev.	Finish
SNA	74.1°	82.0°	-2.6 **	75.7°
SNB	71.8°	80.0°	-2.7 **	74.5°
ANB	2.3°	2.0°	0.1	1.2°
NPo-FH	79.1°	87.6°	-1.5 *	80.4°
SN-MPA	36.7°	32.0°	1.0 *	32.9°
FMA	29.9°	25.0°	0.8	27.6°
<u>1</u> -SN	105.0°	104.0°	0.2	111.6°
<u>1</u> -NA	30.9°	22.0°	1.5 *	35.9°
<u>1</u> -NA	6.9mm	4.0mm	1.0	8.0mm
IMPA	103.9°	90.0°	2.3 **	99.1°
<u>T</u> -APo	3.4mm	1.0mm	1.1 *	5.4mm
<u>T</u> -NB	32.4°	25.0°	1.2 *	26.6°
<u>T</u> -NB	6.3mm	4.0mm	0.8	7.6mm
Interincisal	114.4°	130.0°	-2.6 **	116.4°
Po-NB	0.9mm	1.0mm	-0.0	1.0mm
E Plane	-1.6mm	-2.0mm	0.2	-2.4mm

**Table. 1**

**TABLE 2**  
**CASE 2: IOWA ANALYSIS**

	Initial	Norm	Clin. Dev.	Finish
SNA	78.9°	82.0°	-1.0 *	80.9°
SNB	75.4°	80.0°	-1.5 *	76.8°
ANB	3.5°	2.0°	0.7	4.1°
NPo-FH	81.8°	87.6°	-1.9 *	87.2°
SN-MPA	41.6°	32.0°	2.1 **	40.4°
FMA	35.7°	25.0°	1.8 *	31.0°
<u>1</u> -SN	86.5°	104.0°	-2.9 **	98.8°
<u>1</u> -NA	7.6°	22.0°	-2.4 **	17.9°
<u>1</u> -NA	0.6mm	4.0mm	-1.1 *	0.9mm
IMPA	78.1°	90.0°	-2.0 *	84.6°
<u>T</u> -APo	-1.8mm	1.0mm	-1.2 *	0.3mm
<u>T</u> -NB	15.2°	25.0°	-1.6 *	21.9°
<u>T</u> -NB	2.3mm	4.0mm	-0.6	5.3mm
Interincisal	153.8°	130.0°	4.0 ***	136.1°
Po-NB	1.1mm	1.0mm	0.1	2.1mm
E Plane	-5.0mm	-2.0mm	-1.5 *	-4.9mm

**Table. 2**

**TABLE 3**  
**CASE 3: IOWA ANALYSIS**

	Initial	Norm	Clin. Dev.	Finish
SNA	80.1°	82.0°	-0.6	79.7°
SNB	72.8°	80.0°	-2.4 **	76.0°
ANB	7.3°	2.0°	2.6 **	3.8°
NPo-FH	82.0°	86.8°	-1.6 *	84.5°
SN-MPA	37.6°	32.0°	1.2 *	34.7°
FMA	29.9°	25.0°	0.8	27.6°
<u>1</u> -SN	117.3°	104.0°	2.2 **	101.6°
<u>1</u> -NA	37.2°	22.0°	2.5 **	21.9°
<u>1</u> -NA	8.8mm	4.0mm	1.6 *	3.7mm
IMPA	91.6°	90.0°	0.3	93.9°
<u>T</u> -APo	-3.6mm	1.0mm	-2.0 *	1.5mm
<u>T</u> -NB	22.0°	25.0°	-0.5	24.5°
<u>T</u> -NB	4.2mm	4.0mm	0.1	6.9mm
Interincisal	113.5°	130.0°	-2.8 **	129.8°
Po-NB	3.1mm	1.0mm	1.1 *	3.6mm
E Plane	-0.9mm	-2.0mm	0.6	-4.7mm

**Table. 3**

**TABLE 4**  
**CASE 4: IOWA ANALYSIS**

	Initial	Norm	Clin. Dev.	Finish
SNA	95.6°	82.0°	4.5 ***	82.4°
SNB	83.6°	80.0°	1.2 *	78.8°
ANB	12.0°	2.0°	5.0 ***	3.6°
NPo-FH	85.2°	86.2°	-0.3	86.5°
SN-MPA	31.4°	32.0°	-0.1	29.5°
FMA	29.6°	25.0°	0.8	22.8°
<u>1</u> -SN	118.1°	104.0°	2.4 **	107.1°
<u>1</u> -NA	22.5°	22.0°	0.1	24.7°
<u>1</u> -NA	3.7mm	4.0mm	-0.1	3.7mm
IMPA	92.8°	90.0°	0.5	96.1°
<u>T</u> -APo	-0.2mm	1.0mm	-0.5	2.6mm
<u>T</u> -NB	27.8°	25.0°	0.5	24.4°
<u>T</u> -NB	8.2mm	4.0mm	1.4 *	7.0mm
Interincisal	117.7°	130.0°	-2.1 **	127.3°
Po-NB	-0.3mm	1.0mm	-0.7	2.2mm
E Plane	3.6mm	-2.0mm	2.8 **	-1.0mm

**Table. 4**

## REFERENCES

- 1 Bishara, S.E.; Cummins, D.M.; Jakobsen, J.R.; and Zaher, A.R.: Dentofacial and soft tissue changes in Class II division 1 cases treated with and without extractions, Am. J. Orthod. 107:28-37, 1995.
- 2 Cummins, D.M.; Bishara, S.E.; and Jakobsen, J.R.: A computer assisted photogrammetric analysis of soft tissue changes after orthodontic treatment, Part II: Results, Am. J. Orthod. 108:38-47, 1995.
- 3 Bishara, S.E.; Cummins, D.M.; and Zaher, A.R.: Treatment and post-treatment changes in patients



with Class II division 1 malocclusion after extraction and non-extraction treatment, *Am. J. Orthod.* 111:18-27, 1997.

**4** Battagel, J.M.: The use of tensor analysis to investigate facial changes in treated Class II division 1 malocclusion, *Eur. J. Orthod.* 18:41-54, 1996.

**5** Foley, T.F. and Duncan, P.G.: Soft tissue profile changes in late adolescent males, *Angle Orthod.* 67:373-380, 1997.

**6** Nguyen, D.D. and Turley, P.K.: Changes in the Caucasian male facial profile as depicted in fashion magazines during the twentieth century, *Am. J. Orthod.* 114:208- 217, 1998.

**7** Auger, T.A. and Turley, P.K.: Aesthetic soft tissue profile changes during the 1900's, *J. Dent. Res. (IADR Abstr.)*23:21-28, 1994.

**8** Graber, T.M.: Foreword, *Am. J. Orthod.* 113:1-4, 1998.

**9** Bishara, S.E.; Justus, R.; and Graber, T.M.: Proceedings of the workshop discussions on early treatment, *Am. J. Orthod.* 113:5-6, 1998.

**10** Sinclair, P.M.: The readers' corner, *J. Clin. Orthod.* 31:685-688, 1997.

**11** Dugoni, S.A.; Lee, J.S.; Varela, J.; and Dugoni, A.A.: Early mixed dentition treatment: Post-retention evaluation of stability and relapse, *Angle Orthod.* 65:311-320, 1996.

## **FOOTNOTES**

**1** GAC International, Inc., 185 Oval Drive, Central Islip, NY 11722.