



# The conservative treatment of Class I malocclusion with maxillary transverse deficiency and anterior teeth crowding

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## Abstract

This report describes the treatment of a 15-year-old female patient with Angle Class I malocclusion, severe maxillary anterior crowding, maxillary midline shift to the left, and maxillary atresia associated with posterior crossbite. The treatment consisted of palatal expansion using a modified Haas expander and placement of a standard Edgewise fixed appliance. Interproximal reduction was performed on mandibular incisors and canines to align anterior teeth, as well as to reduce Bolton discrepancy due to wide mandibular teeth. This case was submitted to the Committee of the Brazilian Board of Orthodontics and Facial Orthopedics (BBO) in the Free Case category as part of the requisites to obtain the BBO Diploma.

**Keywords:** Angle Class I malocclusion. Atresia. Palatal expansion. Crowding.

## HISTORY AND ETIOLOGY

The main complaint of this 15-year-old female patient in good general health was the position of her maxillary left canine. During history taking, her guardians reported that her adenoids had not been removed. The size of her palatine tonsils was normal. The patient showed

nasal breathing pattern, satisfactory oral hygiene and no severe periodontal condition.

## DIAGNOSIS

Facial examination did not reveal any evident asymmetries, but the lower third of the face was slightly longer than expected. The facial profile

**How to cite this article:** Nojima LI. The conservative treatment of Class I malocclusion with maxillary transverse deficiency and anterior teeth crowding. *Dental Press J Orthod.* 2011 Sept-Oct;16(5):163-71.

» The author report no commercial, proprietary, or financial interest in the products or companies described in this article.

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FIGURE 1 - Initial facial and intraoral photographs.

was straight, the nasolabial angle was obtuse, and the upper lip was retruded in relation to the Steiner S line (-1 mm). When smiling, maxillary midline shift to the left could be seen, and her smile was not pleasing because of the labioversion of tooth #23 and palatoversion of tooth #22 (Fig 1).

Intraoral examination revealed Angle Class I malocclusion and anterior crossbite of tooth #12, as well as posterior crossbite. Maxillary atresia resulted in anterior edge-to-edge bite and complete absence of space for the correct alignment

of tooth #23. Dentoalveolar discrepancy was -4 mm and, according to Bolton analysis, discrepancy of the anterior mandibular teeth was 2 mm. There was no overbite or overjet (Figs 1 and 2).

Periapical radiographs showed normal bone trabecula and agenesis of teeth #28, #38 and #48; all other permanent teeth were present (Fig 3). Cephalometric analyses showed a good relationship of maxillary and mandibular bones: ANB = 4° (SNA = 83° and SNB = 79°); and vertical growth pattern with GoGn-SN = 39° (Fig 4, Table 1).

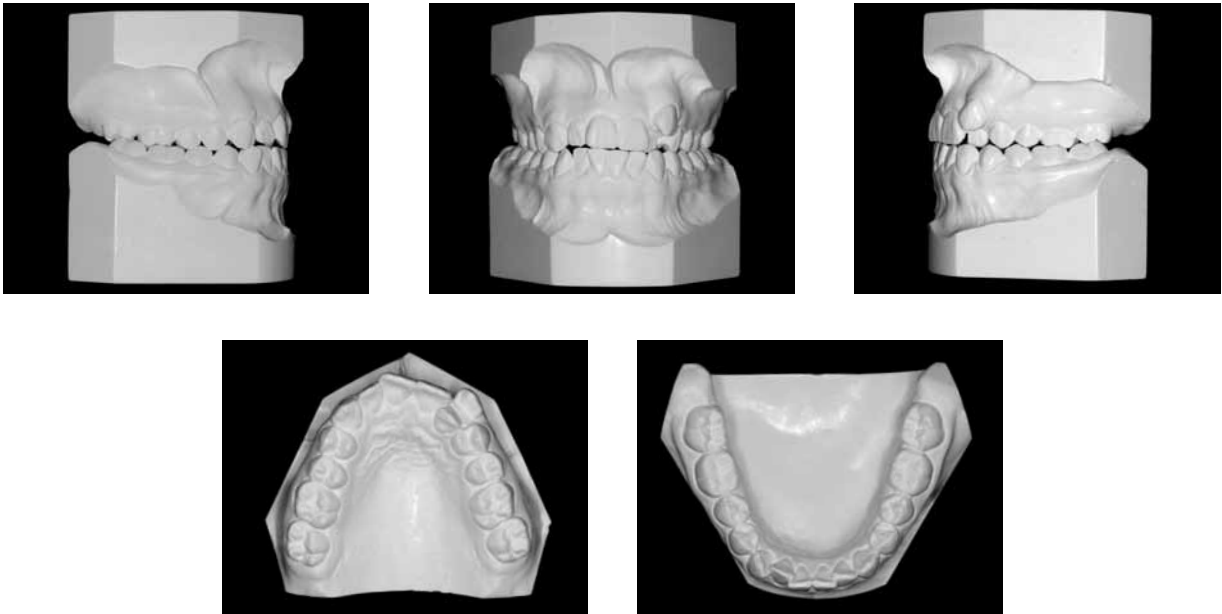


FIGURE 2 - Initial casts.

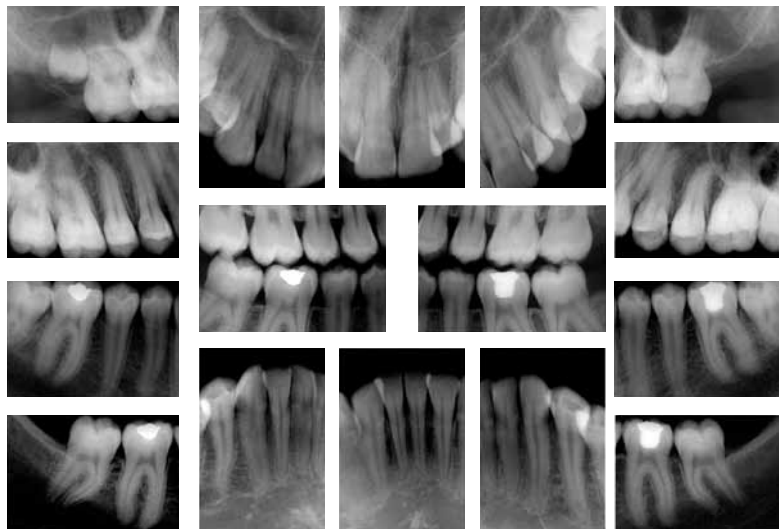


FIGURE 3 - Initial periapical radiographs.

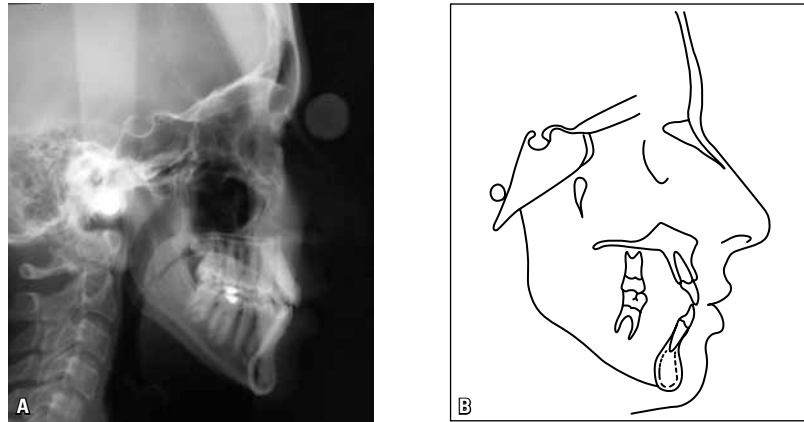


FIGURE 4 - Initial lateral cephalometric radiograph (A) and cephalometric tracing (B).

### TREATMENT OBJECTIVES

The purposes of the treatment were to expand the maxillary arch to treat maxillary atresia and crossbite, to gain space to align the maxillary and mandibular anterior teeth, to create adequate overjet and overbite and to correct the maxillary midline. Further objectives were to maintain normal molar occlusion, improve the shape of dental arches, and avoid tooth extractions during orthodontic treatment. For the facial profile, the objective was to keep the balanced position of the upper lip.

### TREATMENT PLAN

Palatal expansion was achieved with a modified Haas expander with extension to the lingual surface of tooth #13, followed by the use of standard 0.022 x 0.028-in Edgewise fixed appliance and alignment and leveling using round 0.016-in and 0.018-in stainless steel wires. At this stage, midline was corrected and spaces obtained to correct crossbite of tooth #22 and move tooth #23 to its correct position in the dental arch. Bands were cemented to teeth #36, #37, #46 and #47, and accessories bonded to the other teeth. To align mandibular incisor and canines, 2 mm interproximal reduction was performed and the triangular anatomic shape of

those teeth corrected. Round 0.014-in to 0.020-in wires were used to align and level the mandibular teeth. For finishing, rectangular 0.019 x 0.025-in archwires were used, and first, second and third order bends individually prepared according to the need. A wraparound retainer was used for the maxilla, and a 0.028-in intercanine fixed retainer, for the mandible.

### TREATMENT PROGRESS

The patient's main complaint was associated with crowding and crossbite. She received explanations about the need of palatal expansion due to the atresia of the maxillary bone and premaxillary hypoplasia, which resulted in a facial profile with the upper lip positioned behind the esthetic line. The modified Haas expander with extension to tooth #13 was placed. The purpose of the extension was to anchor tooth #13, to which a coaxial 0.028-in wire was bonded on the lingual surface, extending to teeth #12 and #11 (Fig 5). The expander was activated 2/4 of a turn daily, in a total of 8 mm of screw activation. As the interincisal diastema was created, tooth #21 moved mesially towards the open space, and tooth #11 remained anchored to teeth #12 and #13, which avoided its mesial movement towards the diastema and corrected the midline shift.



FIGURE 5 - Occlusal photograph of the modified Haas expander.

A fixed 0.022 x 0.028-in standard Edgewise appliance was then used. Bands were adapted and bonded to teeth #36, #46, #37 and #47, and to the other mandibular teeth except the incisors. In addition, slight interproximal reduction of teeth #42, #41, #32 and #31 was performed. The expander was removed five months after its stabilization, and a 0.045-in buccal archwire was anchored to the 0.051-in buccal tubes, as a retainer for the expansion achieved. For maxillary alignment and leveling, 0.014-in to 0.018-in round archwires were used, and a rectangular 0.016 x 0.022-in blue Elgiloy archwire was used for slight protrusion of maxillary incisors. Immediately after that, the mandibular incisors brackets were bonded, and interproximal reduction of teeth #43 to #33 was performed. Adequate overbite was achieved using a 0.020 x 0.025-in stabilizing archwire with delta loops mesial to teeth #33 and #43, and a 0.019 x 0.025-in maxillary archwire with delta loops mesial to canines, associated with Class II and vertical anterior elastics. Finally, rectangular 0.019 x 0.025-in archwires were manufactured with first, second and third order bends according to the need. Maxillary retention was achieved with a removable wraparound appliance, and mandibular retention, with a bonded 0.028-in intercanine fixed retainer.

## TREATMENT RESULTS

The analysis of patient records after active orthodontic treatment revealed that the main treatment objectives had been achieved.<sup>1</sup> Facial profile was improved because of the more anterior position of the upper lip.<sup>2</sup> Face proportions remained adequate, smile was more harmonious, and the buccal corridor was narrower (Fig 6).

The maxilla gained greater transverse dimensions and a more adequate anatomic width (Table 2). This increase in the upper transverse dimensions affected the intermolar width in the mandibular arch, which resulted in a more vertical position of molars. However, the mandibular plane was increased.<sup>3</sup> The space gained in palatal expansion, associated with anchorage of the expander to teeth #11, #12 and #13, resulted in adequate correction of maxillary midline shift and alignment of teeth #22 and #23 (Fig 6).

To align the dental arches, resilient stainless steel archwires were used to define the direction of the forces applied and to move teeth to the desired positions, as well as to obtain a better periodontal response from support tissues. The protrusive movement of maxillary incisors was achieved by the use of mild forces applied by rectangular 0.016 x 0.022-in blue Elgiloy archwires.<sup>5,6</sup>

To align mandibular teeth, a 2 mm space was created by interproximal reduction of anterior teeth. This procedure promoted the stability of the final position as it increased the contact between these teeth, which had originally an excessively triangular shape (Figs 6 and 7).<sup>7</sup>

Normal molar occlusion was achieved, as well as a good relationship of maxillary and mandibular teeth in static occlusion. The mandibular movements presented normal excursion, with right and left lateral group function, and protrusion with posterior guidance.<sup>8</sup>

Maxillary retention was prescribed for 12 months with a removable appliance to be used 24 hours a day and 12 more months of night use only. Mandibular retention was performed with a 0.028-in stainless steel intercanine fixed retainer.



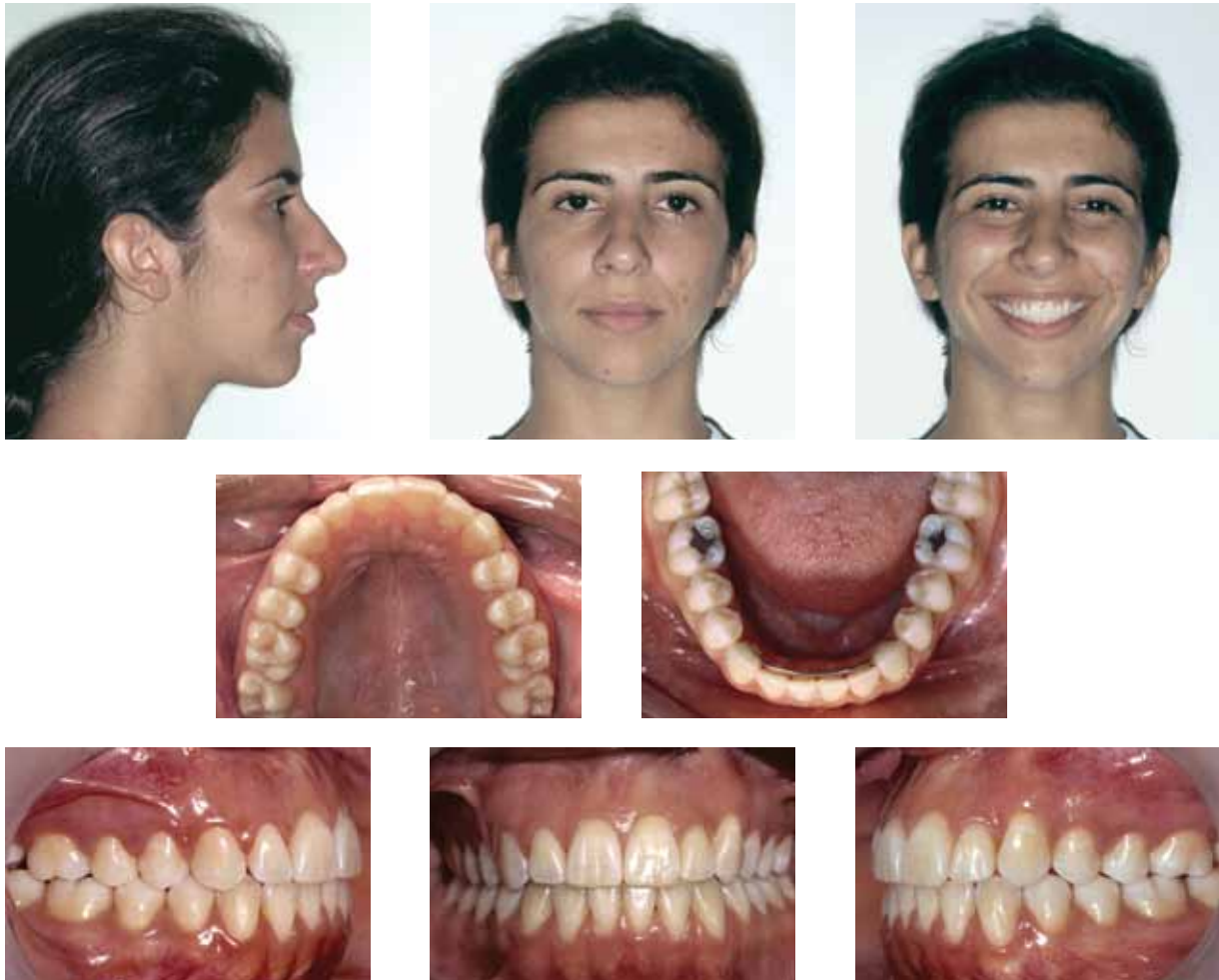


FIGURE 6 - Final facial and intraoral photographs.

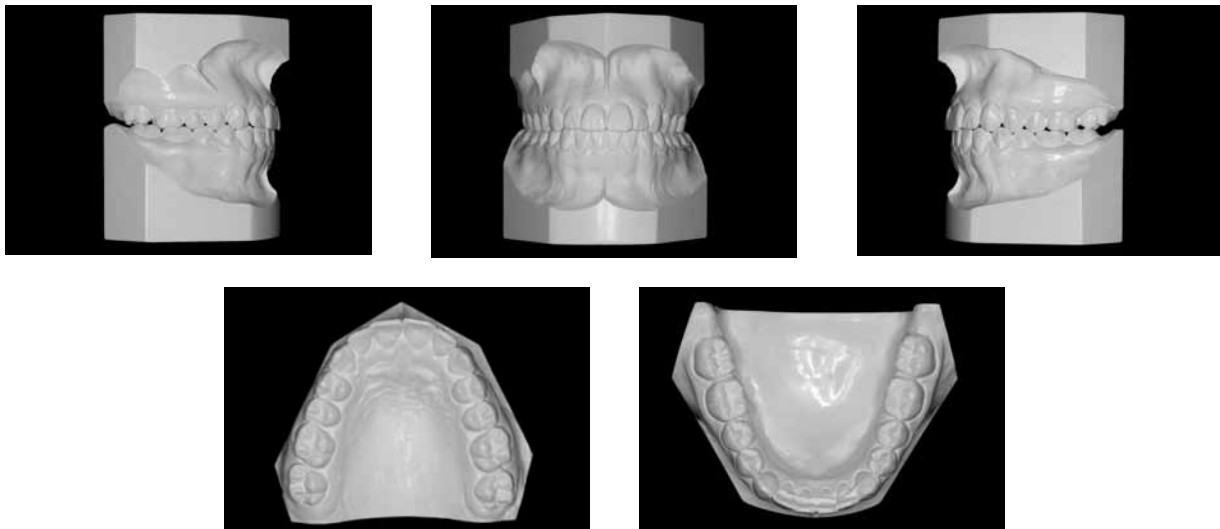


FIGURE 7 - Final casts.

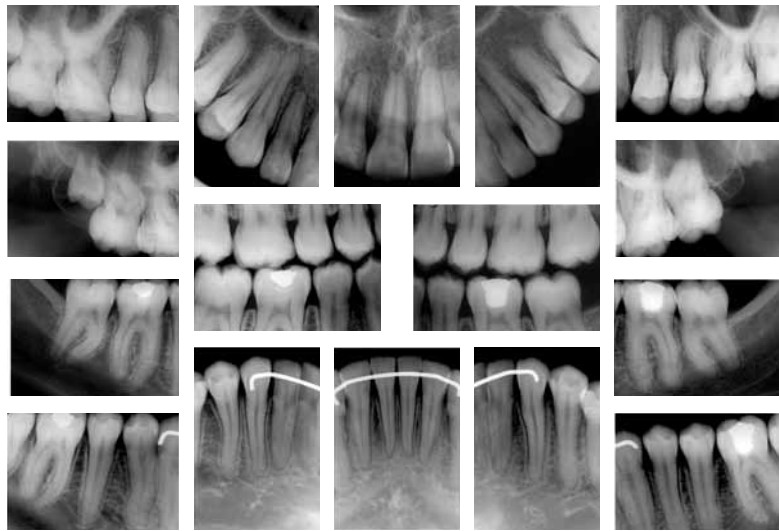


FIGURE 8 - Final periapical radiographs.

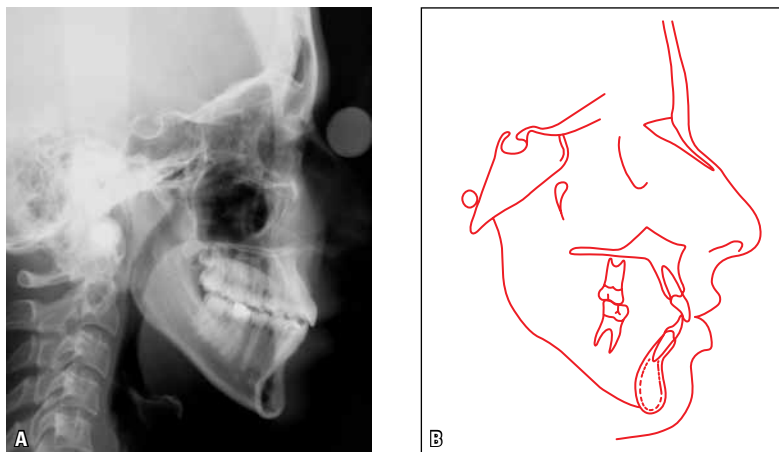


FIGURE 9 - Final cephalometric profile radiograph (A) and cephalometric tracing (B).

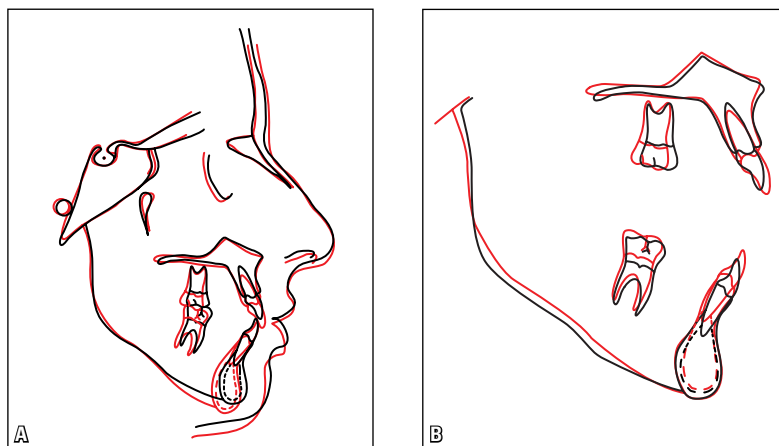


FIGURE 10 - Total (A) and partial (B) superimpositions of initial (black) and final (red) cephalometric tracings.

TABLE 1 - Summary of cephalometric measurements.

	MEASUREMENTS	Normal	A	B	A/B DIFFERENCE
Skeletal Pattern	SNA (Steiner)	82°	83°	83°	0
	SNB (Steiner)	80°	79°	78.5°	0.5
	ANB (Steiner)	2°	4°	4.5°	0.5
	Convexity angle (Downs)	0°	6°	9°	3
	Y axis Angle (Downs)	59°	60°	62°	2
	Facial angle (Downs)	87°	89°	89°	0
	SN-GoGn (Steiner)	32°	39°	43°	4
	FMA (Tweed)	25°	31°	35°	4
Dental Pattern	IMPA (Tweed)	90°	85°	88°	3
	$\underline{1}$ - NA (degrees) (Steiner)	22°	19°	21°	2
	$\underline{1}$ - NA (mm) (Steiner)	4 mm	3 mm	4 mm	1
	$\bar{1}$ - NB (degrees) (Steiner)	25°	24°	31°	7
	$\bar{1}$ - NB (mm) (Steiner)	4 mm	6 mm	8 mm	2
	$\frac{1}{1}$ - Interincisal angle (Downs)	130°	133°	123°	10
	$\bar{1}$ - APo (mm) (Ricketts)	1 mm	3 mm	4 mm	1
Profile	Upper lip - S line (Steiner)	0 mm	-1 mm	-1 mm	0
	Lower lip - S line (Steiner)	0 mm	1 mm	1 mm	0

TABLE 2 - Cast models linear measurements.

CAST TRANSVERSE MEASURES	A	B
Mandibular intercanine width (mm)	24.5	24.5
Mandibular intermolar width (mm)	42.5	44.0
Maxillary intermolar width (mm)	46.5	50

## FINAL CONSIDERATIONS

Facial esthetics became harmonious with slight protrusion of upper lips. The treatment of the maxillary arch was more complex due to the skeletal problem of maxillary atresia associated with the vertical growth pattern, in addition to other problems, such as the maxil-



lary midline shift to the left. To align and level teeth #22 and #23, palatal expansion was associated with the forward movement of incisors and the use of Class II elastics in the left side. To correct the -4 mm mandibular crowding, 2 mm interproximal wears were performed in teeth #33 and #43, and mandibular incisors were slightly moved forward (Figs 8, 9 and

10; Table 1). Total superimposition (Fig 10A) showed clockwise rotation of the mandible, and partial superimpositions (Fig 10B) showed distal movement of tooth #26 and protrusive movement of maxillary and mandibular incisors. The extraction of the maxillary third molar (#18) was recommended because of the expansion of its follicle.

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Submitted: August 2, 2011  
Revised and accepted: August 26, 2011

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