Angle Class II, division 2 malocclusion treated with extraction of permanent teeth*

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Abstract

This study describes the orthodontic treatment of a woman with Angle Class II, division 2 malocclusion, impacted maxillary third molars, periodontal pocket, gingival recession and tooth wear. Treatment consisted of extraction of maxillary second premolars and anchorage control. This case was presented 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 II malocclusion. Adult. Impacted tooth. Periodontal pocket. Tooth extraction. Orthodontic anchorage.

HISTORY AND ETIOLOGY

The patient, encouraged by her periodontist, sought orthodontic treatment at 28 years of age. Her main complaint was unsatisfactory dental esthetics. Her medical history was uneventful. Her dental history, however, reported by the periodontist, included a periodontal pocket in the mesial aspect of the right mandibular first molar (tooth #46), gingival recession in several teeth, tooth wear, and an indication for extraction of impacted maxillary third molars.

DIAGNOSIS

Facial evaluation revealed a harmonious, slightly concave profile, retruded lips, mild facial asymmetry, mandible shifted to the left and gingival display on the right side during smiling (Fig 1).

She presented an Angle Class II, division 2 malocclusion, with characteristic maxillary crowding and less marked mandibular crowding, mesial space in tooth #46 and a prosthesis, smaller when compared with its contralateral tooth. The maxillary gingival margins were uneven, there was discrete gingival recession in teeth #14, 22, 23 and 24, and the occlusal plane was uneven. Maxillary central incisors were retruded, inclined lingually and excessively worn, and lateral incisors were protruding and malformed. Maxillary second premolars had restorations and their size was disproportionate in comparison with the other teeth. The maxillary and mandibular canines had an edge-to-edge relation, marked overbite, and a functional displacement from centric relation (CR) to maximal intercuspation (MI). The upper part of the midline was shifted to the right in relation to the mid sagittal plane, and the lower, to the left (Figs 1 and 2).

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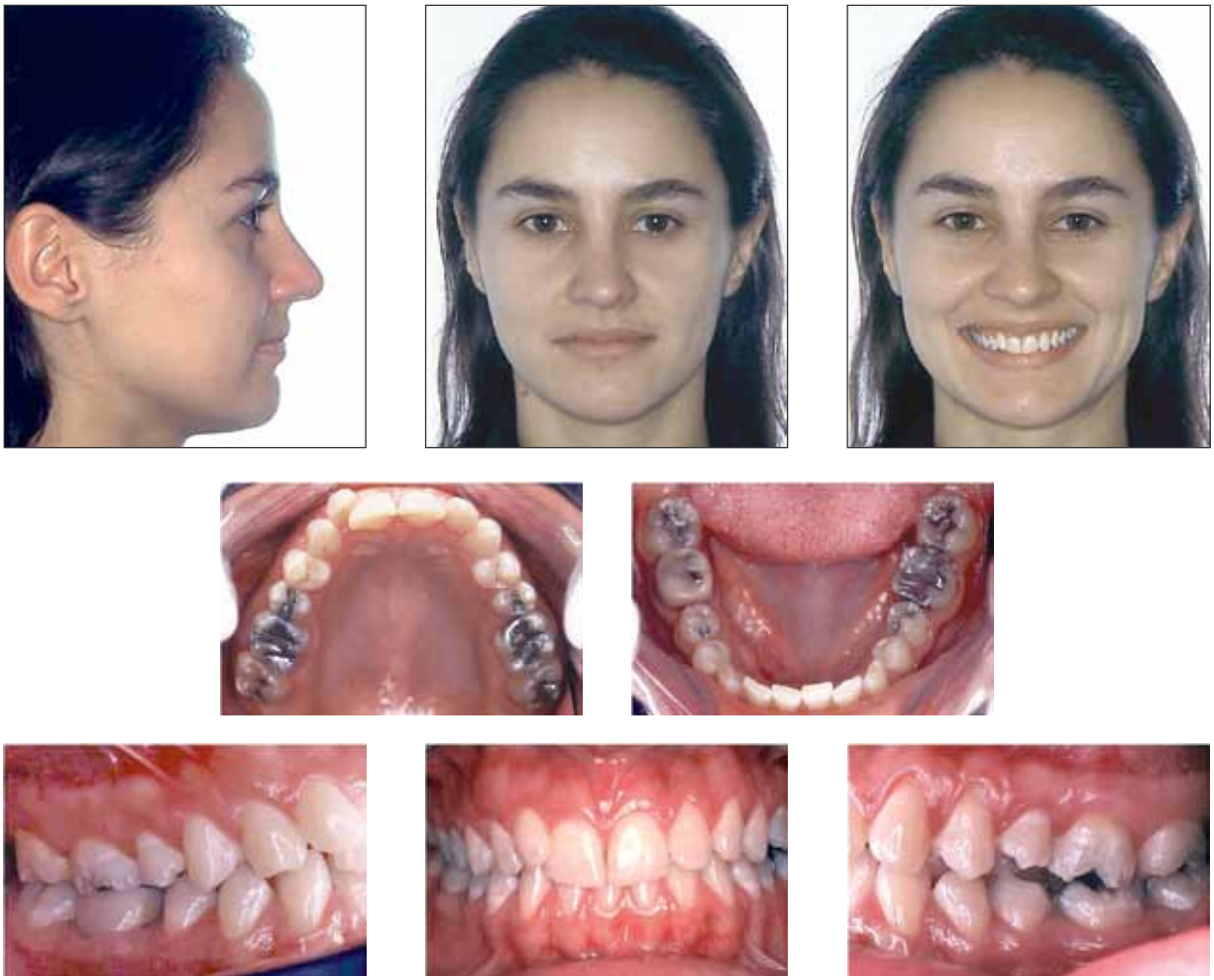

FIGURE 1 - Initial facial and intraoral photographs.

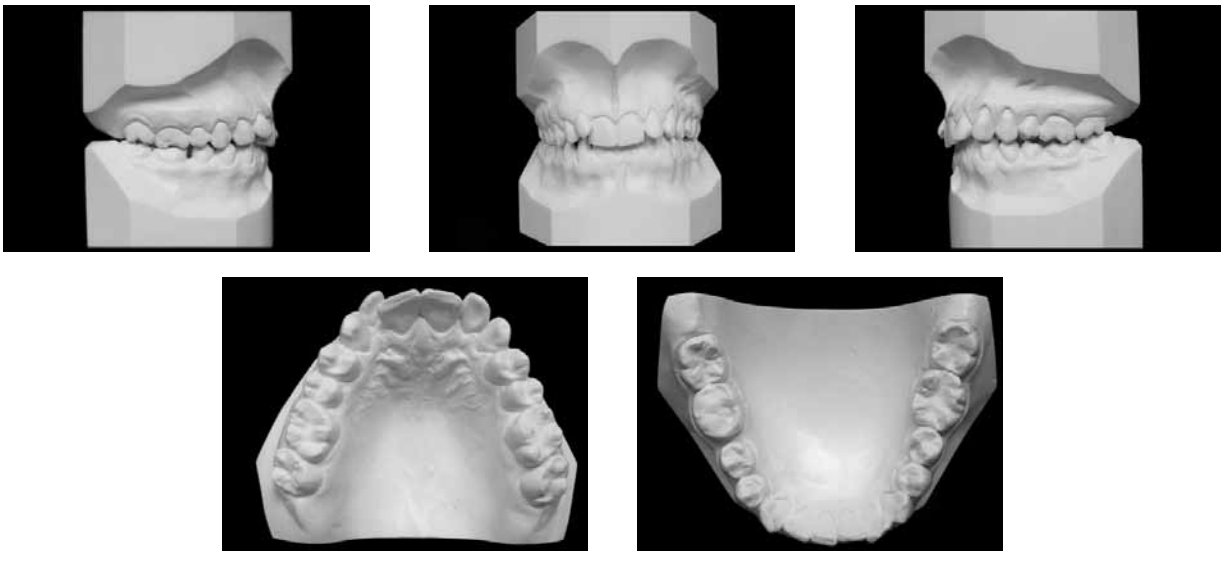

FIGURE 2 - Initial dental casts.

Radiographs showed a mesial periodontal pocket in tooth #46; teeth #38 and 48 were missing, and teeth #18 and 28 were impacted (Fig 3).

Cephalometric evaluation showed skeletal harmony: ANB was 3°, but the low values of the mandibular plane (SN-GoGn=29°and FMA=22°), the high value of the facial angle (89°) and the pogonion shape indicated a brachyfacial profile. Measurements to define dental pattern confirmed retrusion and lingual inclination of maxillary (1-NA=15° and 3 mm) and mandibular (1-NB=19° and 2.5 mm) incisors. Cephalometric measures are shown in Figure 4 and Table 1.

TREATMENT OBJECTIVES

As the main complaint was esthetical, the purpose of the treatment was to level maxillary gingival margins[5] for esthetical and functional rehabilitation, and to extrude tooth #46 to reestablish normal periodontal space, as requested by the periodontist.

Specific objectives were to keep the harmonious facial profile, to improve maxillary occlusal plane by extrusion in the left side but not on the right side, and to obtain a Class II relationship between molars and normal occlusion between canines according to Andrew's keys of occlusion, all under maximal anchorage control, as well as to correct upper and lower midlines, overbite, incisor tipping and leveling of the curve of Spee.

Therefore, at the end of the treatment, facial harmony was expected to be preserved, smile esthetics improved, and centric relation (CR), maximal intercuspation (MI) and normal excursion corrected.

FIGURE 3 - Initial panoramic radiograph.

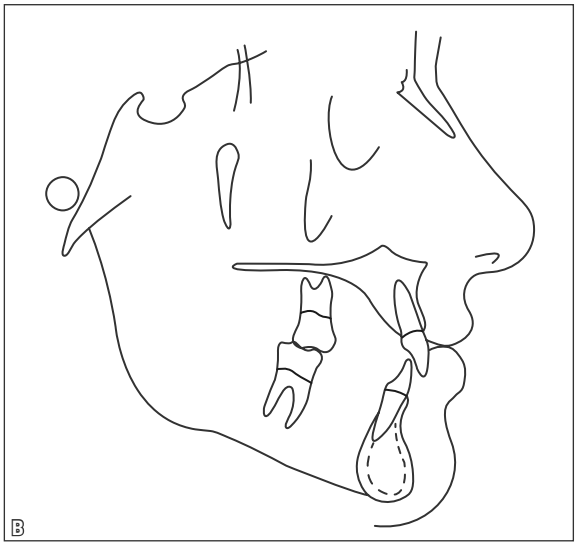

FIGURE 4 - Initial cephalometric profile radiograph (**A**) and cephalometric tracing (**B**).

TREATMENT PLAN

To achieve the treatment objectives, we chose to extract maxillary second premolars[2] because they were very small and had already been restored, although we were aware that this would complicate orthodontic mechanics. First, a fixed appliance would be placed in the upper arch, except for teeth #12 and 22 (Standard edgewise system, 0.018x 0.025-in slot) and a Kloehn extraoral appliance would be prepared for maximal anchorage. For maxillary leveling, 0.015-in round multistranded and 0.014 and 0.016-in stainless steel archwires would be used, but not for maxillary lateral incisors. After that, premolars and canines would be moved distally using chain elastics to create spaces for canines mesially. Then, lateral incisors would be bonded and leveled with nickel-titanium sectional archwires. The mandibular appliance would be mounted up to the second molars as soon as possible and according to the progression of maxillary incisor movement and creation of interocclusal spaces. The same sequence of archwires would be used to level the curve of Spee. Moreover, tooth #46 would be adjusted to enable its extrusion and the elimination of the periodontal pocket. After achieving normal canine occlusion according to Andrew's keys, the incisors would undergo retraction using a 0.017x 0.022-in stainless steel archwire with teardrop-loops. Finally, upper and lower continuous 0.017x 0.022-in stainless steel archwires would be used. According to gingival margin leveling and periodontal pockets in maxillary teeth, the appliance would be reassembled. After the removal of the fixed appliance, a wraparound retainer (full time wear) would be prescribed to be worn until esthetic and functional restorations were made, an intercanine arch would be bonded for mandibular retention, and the new maxillary retainer would be installed, in accordance with the new teeth shapes. The third molars would be followed up to define whether they should be preserved or extracted later on.

TREATMENT PROGRESSION

The maxillary appliance was installed using orthodontic bands in the first molars, and 0.018x 0.025-in standard-Edgewise slot metal brackets were bonded on the other teeth except lateral incisors and second premolars. After that, the extraction of the second premolars was requested and the Kloehn extraoral appliance was adapted for nighttime wear. Individualized 0.015-in round multistranded and 0.014 and 0.016-in stainless steel archwires and elastic chains were used for maxillary alignment and leveling, including first premolars and canines, but not lateral incisors. After mesial spaces were created for the canines, lateral incisors were bonded and leveled using 0.012 to 0.016-in nickel-titanium wires and sectional archwires under straight wire. In the mandibular arch, brackets were bonded up to the second molars. Alignment and leveling were achieved using straight wires in the same sequence as in the maxillary arch. A small retraction of the maxillary incisors was necessary; for that, 0.017x0.022-in stainless steel archwire with teardrop-loops was used. To complement alignment and leveling, 0.017x0.022-in stainless steel coordinated wires were used. After that, a panoramic radiograph was obtained to evaluate root inclination, and the positions of some brackets were changed for leveling using 0.012 and 0.014-in nickel-titanium wires under rectangular wires. Finally, the same rectangular wires were used in association with elastics to achieve Class II occlusion on the left side. After evaluation by the periodontist, the appliance was removed and the wraparound retainers were installed for full time wear. As previously agreed on with the dentist, the patient was referred to a specialist for whitening and restorations and returned for a new maxillary retainer and bonding of the maxillary intercanine arch.

FIGURE 5 - Final facial and intraoral photographs.

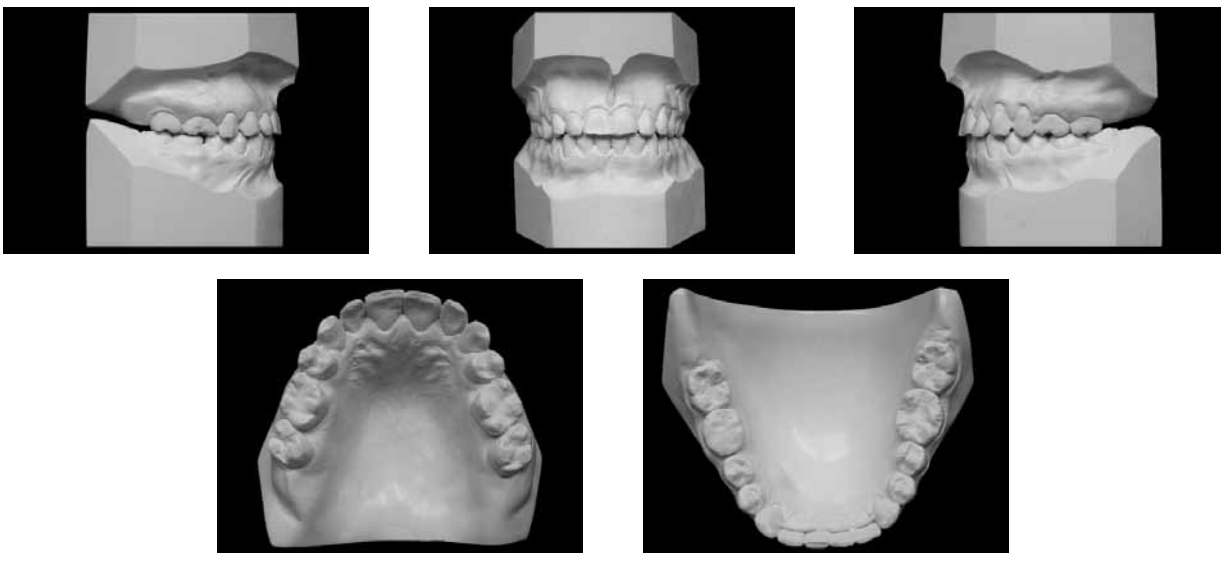

FIGURE 6 - Final casts.

TREATMENT RESULTS

The main treatment objectives were achieved, as confirmed by the patient's final examinations (Figs 5-8).

In the maxilla, the SNA angle was reduced in 1 degree because of bone remodeling resulting from the correction of incisor tipping.[1] In the mandible, the mandibular plane angles (SN-GoGn and FMA) and Y axis were reduced, and the facial angle increased, although a Kloehn extraoral appliance was used. The analysis of dental pattern confirmed that there were positive changes in incisor position and tipping, as well as a better leveling of gingival margins. The evaluation of total cephalometric comparison confirmed profile, maxillary and dental changes. The partial comparison showed changes in A point[1] and dental changes (Fig 9).

A Class II relation was achieved between molars, together with intentional maxillary premolar and molar rotation to improve intercuspation and normal canine occlusion according to Andrew's keys. Dental midlines coincided with the facial midline. Overbite was corrected as the maxillary and mandibular incisors were intruded and the curve of Spee was leveled. Gingival recessions did not change because tooth #22 recession did not allow for the definition of a better contour for the gingival margins (Figs 5 and 6).

FIGURE 7 - Final panoramic radiograph.

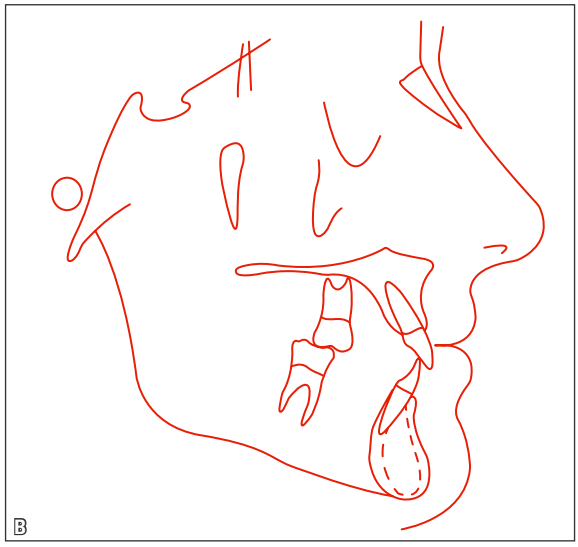

FIGURE 8 - Final cephalometric profile radiograph (**A**) and cephalometric tracing (**B**).

FIGURE 9 - Total (**A**) and partial (**B**) comparisons of initial (black) and final (red) cephalometric tracings.

FIGURE 10 - Facial and intraoral photographs four years and five months after treatment completion.

Intercanine and intermolar distances remained unaltered. Maxillary intercanine distance increased 3.7 mm as a result of canine distal movement, and maxillary intermolar distance decreased 4.1 mm due to the loss of anchorage and the intentional mesial rotation of molars (Table 2).

The analysis of radiographs revealed bone leveling in tooth #46, and root dilacerations, mostly in the canines, which were visible only after rotations were corrected. Despite these dilacerations, roots were parallel and root rounding was compatible with the great amount of movement of maxillary central incisors. Root resorption, more marked in tooth #12[6], occurred primarily in the last phase of the treatment, and will be followed up. The progression of third molar eruption was small and will continue under observation (Fig 7).

Facial profile remained harmonious despite slight lip retrusion,[3] the smile was significantly improved after the correction of the maxillary occlusal inclination and the adequate alignment and leveling of anterior teeth, and the esthetic and functional rehabilitation desired by the patient was achieved.

The evaluation of control examinations (Figs 10-14) performed 4 years and 5 months after treatment completion showed esthetic and functional resin restorations in the anterior teeth, the metal-ceramic prosthesis of tooth #46, and other restorations that had been made by her clinical dentist. Occlusion remained balanced, there were no shifts in CR or MI, and intercanine and intermolar distances remained stable. Cephalometric measures either remained stable or had minor changes. Radiographs confirmed the apparent stability of root resorptions and the good progression of maxillary third molar eruption. In this phase, the maxillary retainer was changed to include buccal springs in teeth #18 and 28 to help correcting their position.

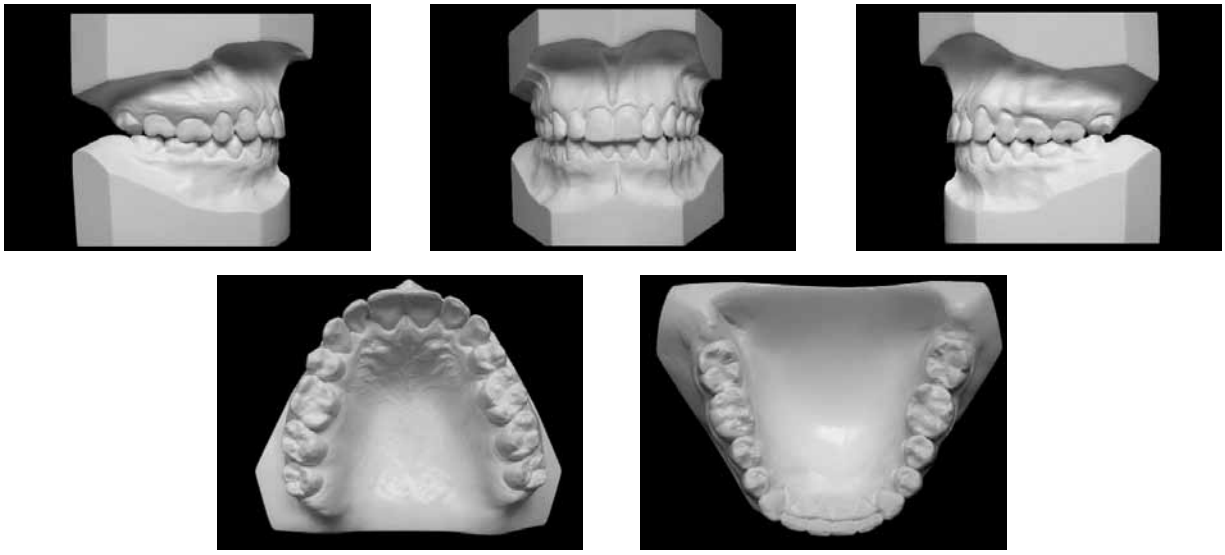

FIGURE 11 - Control dental casts four years and five months after treatment completion.

FIGURE 12 - Control panoramic radiograph four years and five months after treatment completion.

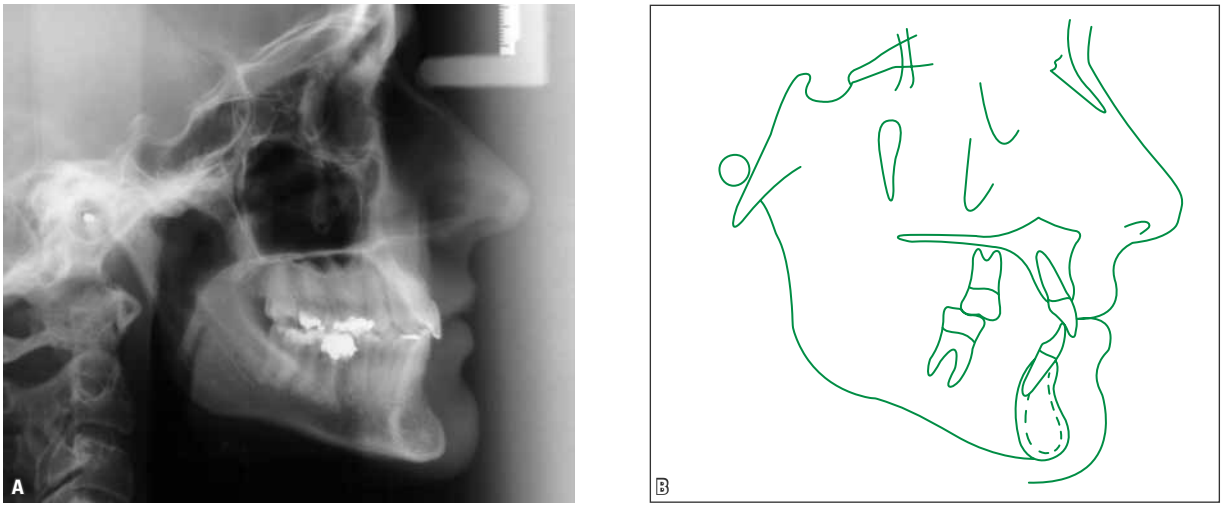

FIGURE 13 - Control cephalometric profile radiograph (**A**) and cephalometric tracing (**B**) four years and five months after treatment completion.

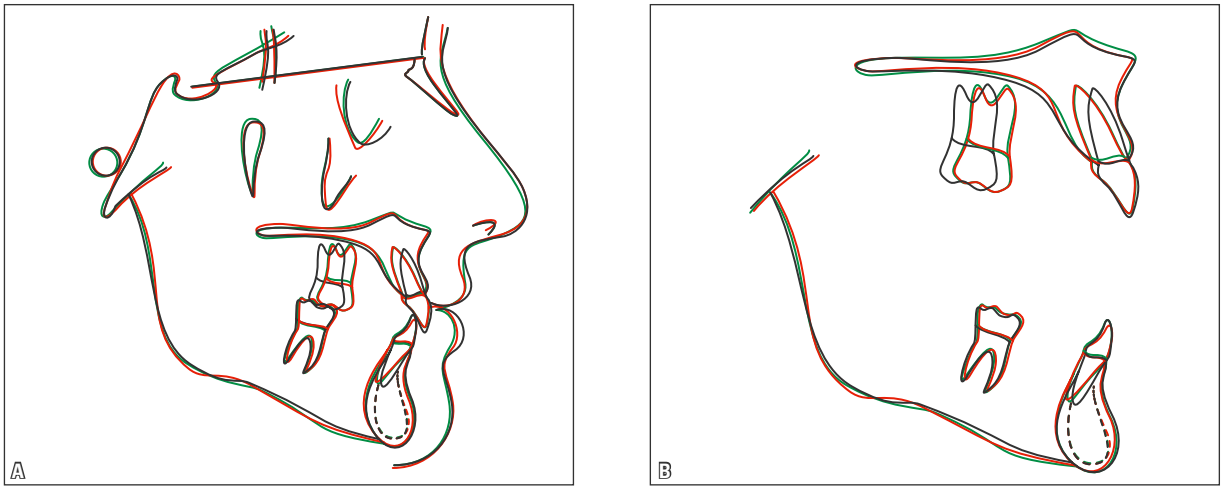

FIGURE 14 - Total (**A**) and partial (**B**) comparisons of cephalometric tracings at initial (black), final (red) and four years and five months after treatment completion (green).

TABLE 1 - Summary of cephalometric measurements.

	MEASUREMENTS	Normal	A	B	A/B DIFFERENCE	C
Skeletal Pattern	SNA (Steiner)	82°	81°	80°	-1	80°
	SNB (Steiner)	80°	78°	78°	0	78°
	ANB (Steiner)	2°	3°	2°	-1	2°
	Convexity angle (Downs)	0°	0.5°	0°	-0.5	0.5°
	Y axis (Downs)	59°	59°	58°	-1	58°
	Facial angle (Downs)	87°	89°	90°	1	90°
	SN–GoGn (Steiner)	32°	29°	28°	-1	28°
	FMA (Tweed)	25°	22°	20°	-2	20°
Dental Pattern	IMPA (Tweed)	90°	93°	99°	6	99°
	$\underline{1}$ – NA (degrees) (Steiner)	22°	15°	23°	8	22°
	$\underline{1}$ – NA (mm) (Steiner)	4 mm	3 mm	4 mm	1	4 mm
	$\overline{1}$ – NB (degrees) (Steiner)	25°	19°	25°	6	26°
	$\overline{1}$ – NB (mm) (Steiner)	4 mm	2.5 mm	3 mm	0.5	3 mm
	$\frac{1}{1}$ – Interincisal angle (Downs)	130°	142°	128°	-14	130°
	$\overline{1}$ – APo (mm) (Ricketts)	1 mm	-1.5 mm	-0.5 mm	1	-0.5 mm
Facial Profile	Upper lip – S line (Steiner)	0 mm	-3 mm	-4.5 mm	-1.5	-4.5 mm
	Lower lip – S line (Steiner)	0 mm	-2 mm	-3.5 mm	-1.5	-3.5 mm

TABLE 2 - Transverse distances of dental arches.

MEASUREMENTS	A	B	A/B DIFF.	C
Mandibular intercanine distance	25.6 mm	25.6 mm	0	25.6 mm
Mandibular intermolar distance	43.6 mm	43.6 mm	0	43.1 mm
Maxillary intercanine distance	33 mm	35.6 mm	+2.6	35.6 mm
Maxillary intermolar distance	48.8 mm	44.7 mm	-4.1	44.7 mm

FINAL CONSIDERATIONS

As the patient's main complaint was about dental esthetics, the main treatment objectives have been achieved. Correct incisor alignment and leveling resulted in the desired esthetic and functional rehabilitation.

In adult patients, the plan to treat Angle Class II, division 2 malocclusion often includes the extraction of the maxillary first premolars to facilitate anchorage and reduce treatment time. In this case, because of the size and clinical condition of

the second premolars, we chose to extract them, although we were aware that this would make anchorage more difficult.

The evaluation of total cephalometric comparison (Fig 14) confirmed the preservation of the skeletal pattern and the changes in dental pattern and facial profile. Bone remodeling due to the correction of maxillary incisor tipping and associated with the marked retraction of maxillary lateral incisors was confirmed in the partial comparison of the maxilla. As maxillary lateral incisors worked as support for the lips in the beginning of the treatment, those changes might have resulted in a slight lip retrusion and made the profile more concave.

Control examinations (Figs 10-14) showed that the smile improved, the profile remained harmonious and occlusion remained stable, which confirms that the treatment objectives have been achieved.

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