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AN ORTHODONTIC-SURGICAL APPROACH TO CLASS II SUBDIVISION MALOCCLUSION TREATMENT

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ABSTRACT

Despite the different orthodontic approaches to Class II subdivision malocclusions one has also to consider the skeletal components before undertaking any treatment protocol. Significant involvement of the skeletal structures may require a combined surgical orthodontic treatment, which has remained stable for more than four years, as illustrated in this case report.

Key words: Class II subdivision. Orthodontic-surgical approach.

INTRODUCTION

Class II subdivision malocclusions can be corrected through a variety of treatment protocols, depending on the etiological factor which produces the asymmetric dentoalveolar characteristics of the malocclusion[1,11-15,24,29]. However, when there is also a severe skeletal component associated with the malocclusion, such as a vertical growth pattern and a retruded mandible, a combined surgical approach would be the best treatment option[2,7,8,26,30,33]. Therefore, the purpose of this article is to describe the combined surgical/orthodontic diagnosis and treatment of a Class II subdivision malocclusion with these characteristics and discuss the pros and cons of this approach.

DIAGNOSIS AND ETIOLOGY

J.F.P presented for orthodontic treatment at the private office of Dr. MJ with the chief complaint of protrusive incisors and gummy smile. He was 16 years and 9 months old with a Class II Division 1 subdivision right malocclusion with 7mm of overjet, lower midline deviated 2 mm to the right, a retrognathic mandible, a hyperdivergent skeletal pattern and incompetent lips (Figures 1 to 3 and Tables 1 and 2).

TREATMENT OBJECTIVES

The treatment objectives were to improve the facial profile, correcting the retrognathic mandible, the excessive lower anterior face height, the gummy smile and the mandibular dental midline discrepancy, finishing with ideal overbite and overjet.

TREATMENT ALTERNATIVES

Based on the objectives one of the treatment options would be to extract 2 maxillary premolars and 1 mandibular premolar on the Class I side[1,5,6,11-15,28,29,32]. However, this would not reduce his excessive lower anterior face height and would not improve his retrognathic mandible. Consequently, no improvement in his gummy smile could be anticipated. Another treatment option consisted of extracting the mandibular left first premolar, retracting the lower anterior teeth and surgically advancing the mandible while impacting the maxilla. Maxillary impaction can significantly improve a gummy smile[3,20,21]. Because the patient and his parents were chiefly concerned with the gummy smile, they chose the second option.

FIGURE 1- Pretreatment extraoral and intraoral photographs (patient signed informed consent authorizing the publication of these pictures)

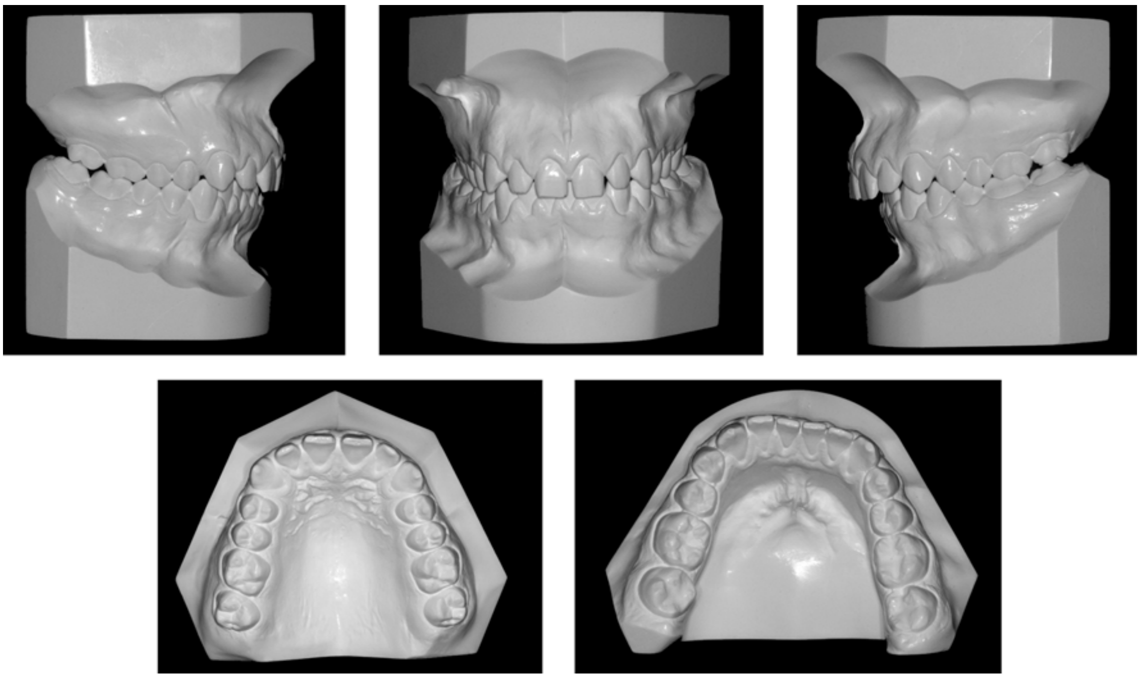

FIGURE 2- Pretreatment study models photographs

TREATMENT PROGRESS

Pre-adjusted 0.022x0.030-inch slot fixed appliances were used. After extraction of the mandibular left first premolar, leveling and alignment with the usual wire sequence of 0.016-inch nitinol, followed by 0.016, 0.018 and 0.020-inch round stainless steel archwires was accomplished (Figure 4). Left anterior retraction was performed with rectangular stainless steel archwires (0.019 x 0.025-inch). Twenty-five months later, when the left canine reached a Class II relationship and the extraction space was closed, orthognathic surgery was undertaken. The surgical

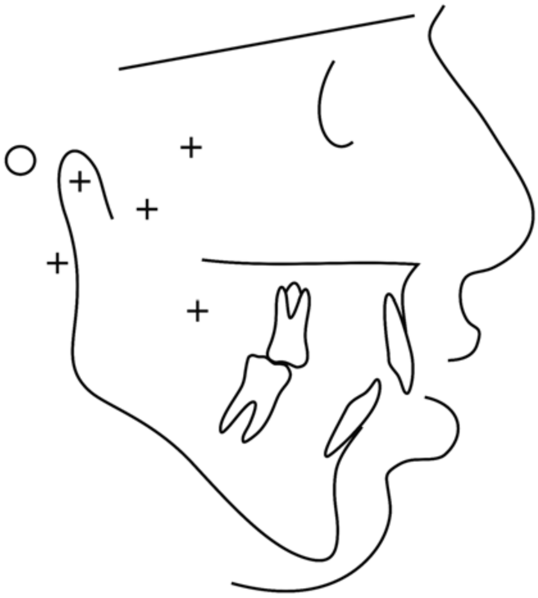

FIGURE 3- Pretreatment headfilm and cephalogram

TABLE 1- Definition of unusual cephalometric variables

	Maxillary component
A-Nperp	Distance between A point to nasion-perpendicular
Co-A	Distance between Condylion to A point
SN.PP	Angle formed between sella nasion line and palatal plane
	Mandibular component
P-Nperp	Distance between pogonion to nasion-perpendicular
Co-Gn	Distance between condylion to gnathion
	Maxillomandibular relationship
NAP	Supplementary angle formed by point N, A and pogonion.
	Facial Pattern
LAFH	Lower anterior face height: distance from anterior nasal spine to menton.
	Maxillary dental component
Mx1.NA	Maxillary incisor long axis to NA angle
Mx1-NA	Linear distance between the most anterior point of crown of maxillary incisor and NA line
	Mandibular dental component
Md1.NB	Mandibular incisor long axis to NB angle
Md1-NB	Linear distance between the most anterior point of crown of mandibular incisor and NB line
	Soft tissue component
Mentolabial Sulcus	Angle formed between: labrale inferius, soft tissue B point and soft tissue pogonion.
Max1 Exposure	Distance between the maxillary central incisor edge and the upper lip

protocol consisted of impacting the maxilla 7mm anteriorly and 4mm posteriorly, with 1mm of advancement. This would also produce a counter-clockwise mandibular rotation, projecting the chin anteriorly. Surgery in the mandible consisted of an advancement and counterclockwise intramandibular rotation to adapt it to the differencial impaction of the maxila. Subsequent minor orthodontic finishing procedures took an additional year. The patient was retained with a maxillary Hawley plate and a mandibular bonded canine-to-canine retainer. Total active treatment time was 3 years and 1 month.

TABLE 2- Cephalometric status at the pretreatment and posttreatment stages

Measurements	Unit	Standard Values[2,9,10,17,19,23,27,31]	Pretreatment	Posttreatment
		Maxillary component		
SNA	°	82	77.6	77.8
A-NPerp	mm	+1	- 2.8	- 3.6
Co-A	mm	85	89.8	88.8
		Mandibular component		
SNB	°	80	70.4	72.1
P-NPerp	mm	- 2/+4	-18.1	-15.7
Co-Gn	mm	108	117.0	117.0
		Maxillomandibular relationship		
ANB	°	2	7.2	5.7
Mx-Md Diff	mm	30	26.8	27.0
NAP	°	1.6	13.2	8.6
Wits	mm	0	6.6	-1.6
		Facial Pattern		
SN-Ocl	°	14	12.6	18.9
FMA	°	25	37.4	35.4
SN-GoGn	°	32	45.3	42.5
LAFH	mm	62	76.8	77.3
		Maxillary dental component		
Mx1.NA	°	22	13.2	13.3
Mx1-NA	mm	4	2.4	2.4
		Mandibular dental component		
Md1.NB	°	25	27.1	34.2
Md1-NB	mm	4	7.1	8.4
IMPA	°	87	89.2	97.7
		Soft tissue component		
Nasolabial angle	°	102	97.4	92.3
Mentolabial Sul	mm	4	8.9	6.9
Li-HLine	mm	0 to 0.5	4.8	1.9
Interlabial Gap	mm	2	8.9	2.1
Upper Lip Length	mm	19 to 22	24.5	30.7
Max 1 Exposure	mm	2	8.4	4.3

FIGURE 4- Leveling and alignment with 0.020-inch stainless steel archwire

TREATMENT RESULTS

The extraoral photographs show a symmetric, harmonious relationship of the facial soft tissue and a pleasant profile, with passive lip competence. A Class I bilateral canine occlusion with normal anterior relationship was obtained (Figures 5 to 7). The panoramic radiograph revealed good root parallelism and bone integration in the maxillary right canine area, as well

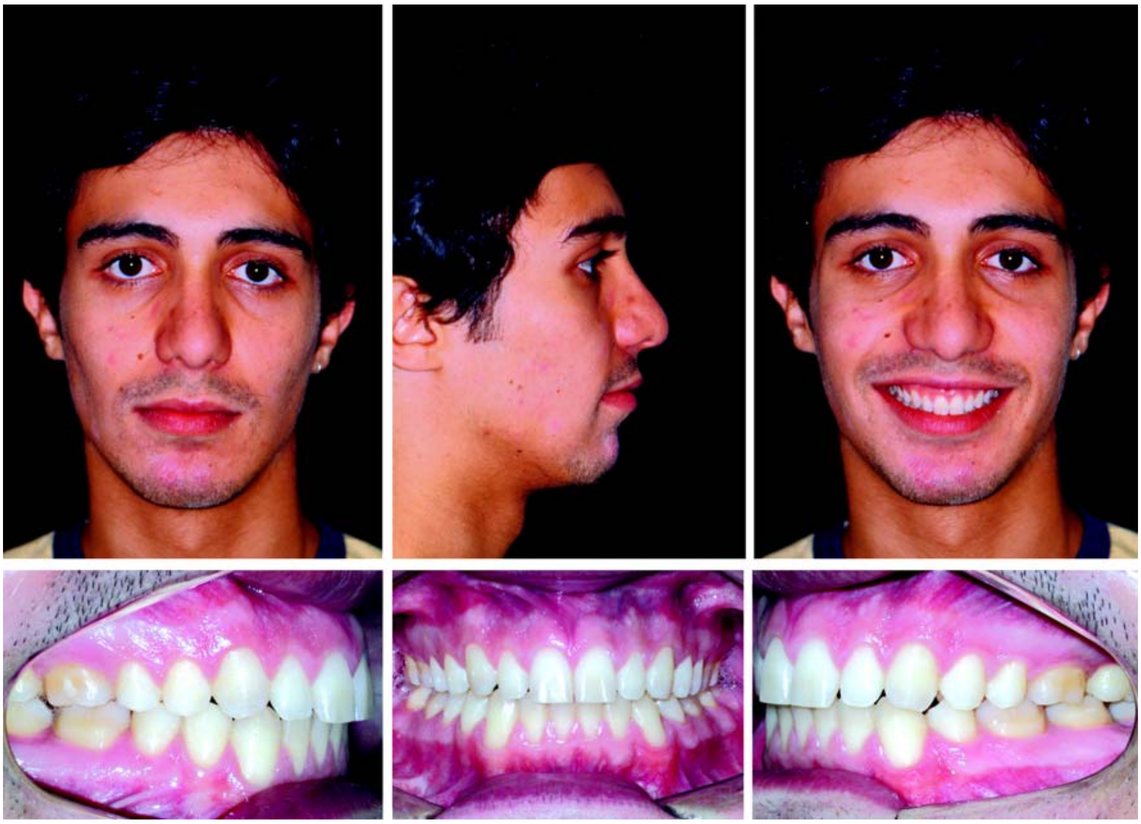

FIGURE 5- Posttreatment extraoral and intraoral photographs (patient signed informed consent authorizing the publication of these pictures)

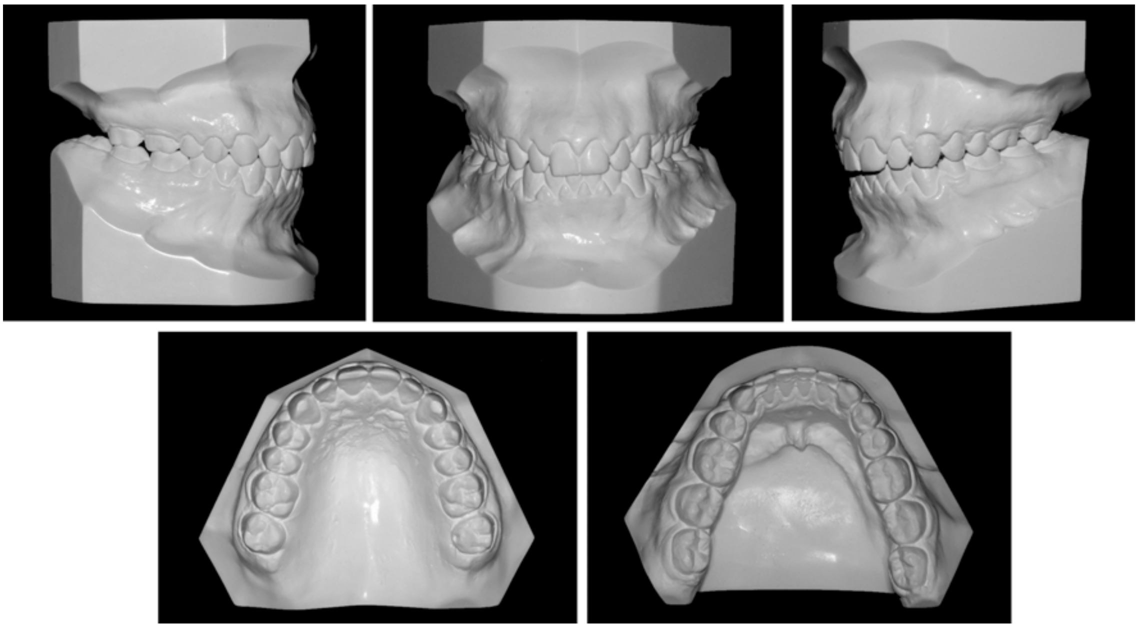

FIGURE 6- Posttreatment study models

as root length control in the maxillary incisors (Figure 8). The superimposition shows the amount of maxillary impaction and consequent mandibular counterclockwise rotation contributing to a more favorable anteroposterior chin position and improvement in lip competence, despite the increase in lower anterior face height (Figure 9). Cephalometrically, there was no increase in mandibular length, but due to the counterclockwise mandibular rotation there was an increase in mandibular protrusion, which contributed to reduce the apical base anteroposterior discrepancy and profile convexity.

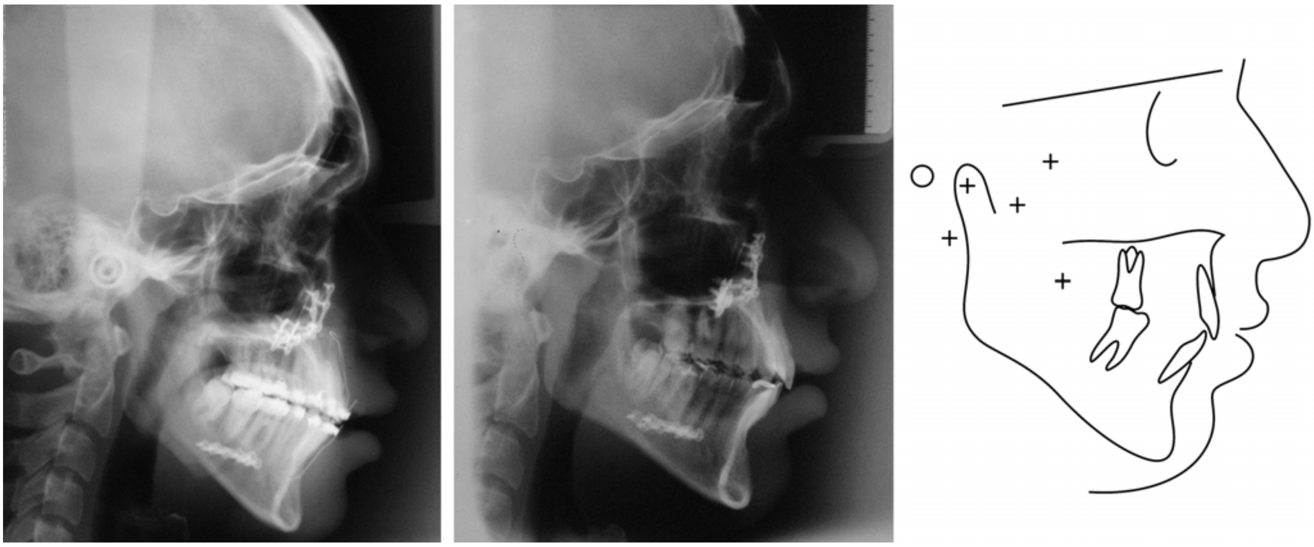

FIGURE 7- A- Headfilm immediately after surgery. B- Posttreatment headfilm and cephalogram

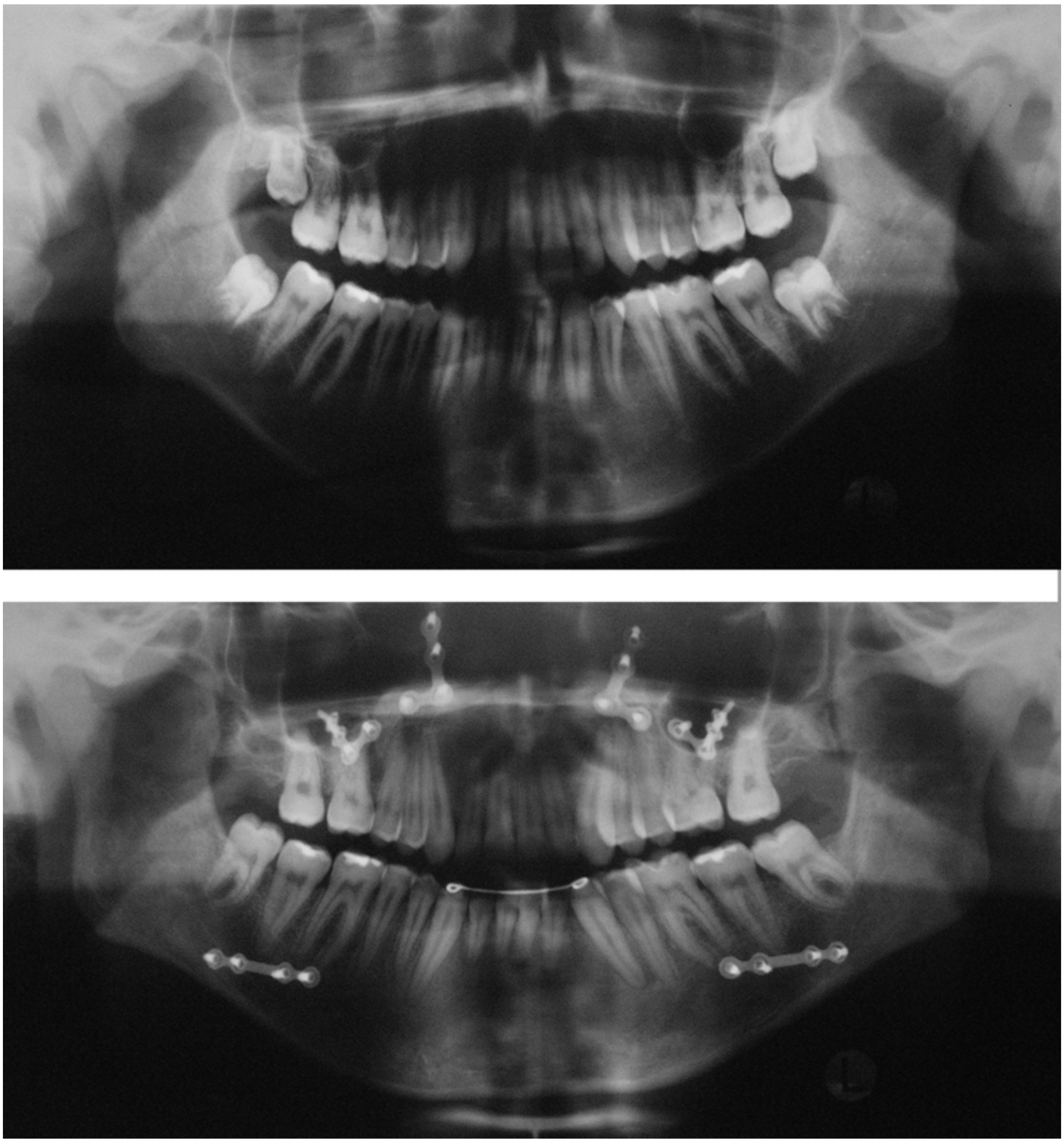

FIGURE 8- A- Pretreatment panoramic radiographs. B- Posttreatment panoramic radiographs

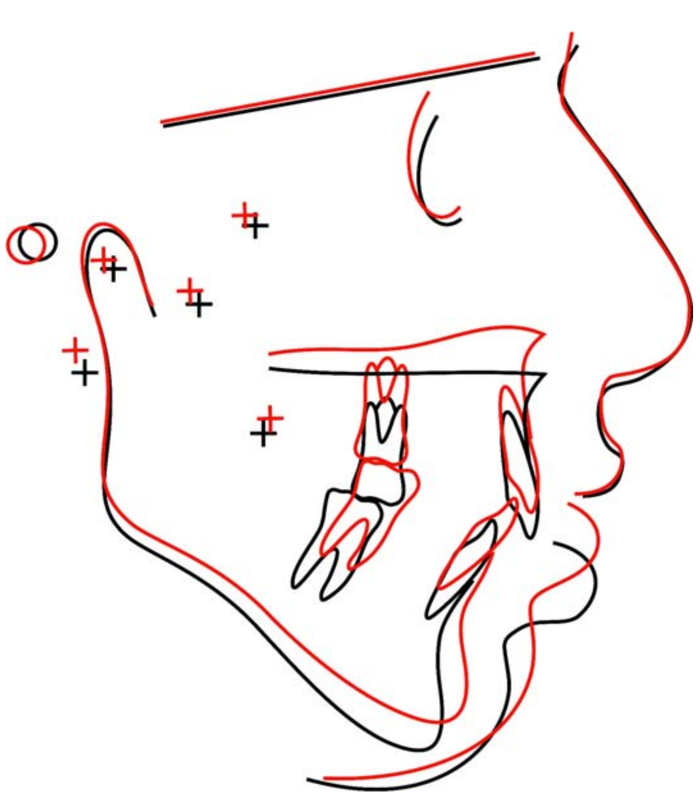

FIGURE 9- Superimpositions of initial and final tracings (black: pretreatment; red: posttreatment)

DISCUSSION

According to recently suggested classification of Class II subdivision malocclusions, this case would be classified as a Type 1 subdivision case because the maxillary midline is coincident to the midsagittal plane and the mandibular midline is deviated to the right[11-15,29]. It is also suggested in these cases, extraction of two maxillary premolars and one mandibular premolar on the Class I side, provided that the patient's profile allows for some incisor retraction[1,5,6,11-15,28,29,32]. The patient´s profile would allow some retraction of the incisors. However, this treatment protocol would not be able to decrease his gummy smile, which was his chief complaint, and improve his mandibular retrognathism. Therefore, this was the reason why the patient and his parents selected the surgical-orthodontic approach. This shows that despite there are some suggested treatment protocols for Class II subdivision treatment, a thorough examination of all the aspects has to be performed before a conclusive treatment plan is elaborated. Had the patient refused a surgical intervention, the three-premolar extraction protocol could be performed. However, the gummy smile and the mandibular retrognathism would not improve.

Extraction of the first left mandibular premolar and retraction of the anterior segment was performed with the intention of creating a bilateral canine Class II dental malocclusion that would allow symmetric advancement of the mandible, whereas it was symmetric. If the mandible was asymmetric, maintenance of the asymmetric canine malocclusion would be indicated, requiring surgical correction with asymmetric mandibular advancement[16]. With differential impaction of the maxilla, 7mm anteriorly and 4mm posteriorly, there was a counterclockwise mandibular rotation which concurrently advanced the mandible, correcting the Class II malocclusion. The surgical mandibular advancement was also associated to an intramandibular counterclockwise rotation to adapt it to the differential impaction of the maxilla, so that no increase in the effective mandibular length was observed (Table 2). This treatment protocol was possible to be undertaken because there was no apparent skeletal facial asymmetry of the patient as is usually the case in Class II subdivision patients[1,15,24] (Figure 1). Therefore, no asymmetric surgery had to be performed.

The cephalometric treatment changes demonstrate the effect of the treatment protocol on the dentoskeletal structures. There was an increase in mandibular prognathism, with resultant improvement in apical base anteroposterior relationship and facial convexity. The SN to occlusal plane angle increased, despite the counterclockwise mandibular rotation. Probably this was consequent to post-surgical use of Class II elastics to improve the dental anteroposterior relationship[4,18,22,25]. FMA and SN.GoGn decreased, as expected, with the counterclockwise mandibular rotation. Another possible side effect of Class II elastics were the mandibular incisor labial proclination and protrusion that occurred. In fact, despite the good patient compliance with elastics use, the canines on the left side still demonstrate a slight Class II relationship (Figures 5 and 6). The maxillary impaction decreased the interlabial gap and the maxillary incisor exposure. These were the most important changes required by the patient and his parents. Therefore, as these expectations were met with the proposed treatment, they were very satisfied with the results.

CONCLUSIONS

Treatment of Class II subdivision malocclusions, after a careful diagnosis is performed, can be orthodontically handled throughout a variety of treatment protocols. However, if a severe skeletal discrepancy is associated with the malocclusion, a combined orthodontic-surgical approach, as presented, will provide a better esthetic result for the patient. Asymmetry of the malocclusion has to be associated with facial asymmetry. If the face is also asymmetric, the asymmetric malocclusion is maintained pre-surgically, but if the face is symmetric, the malocclusion must be modified so that the basal bone can be symmetrically manipulated.

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