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Research

Orthodontic treatment of Class III malocclusion with lower extraction and anchorage with mini implants: Case report

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ABSTRACT

This article reports the case of an adult patient with Class III malocclusion with mandibular deviation to right side and right anterior and posterior crossbite treated by retraction of the lower teeth with the aid of mini implants in the retromolar region on both sides. The patient opted to not perform surgery for correction of facial asymmetry, thus the treatment consisted of asymmetric extraction (34 and 38) and placement of absolute anchorage devices distal to the lower second molars in the retromolar area, which assisted in the distal movement of the lower molars and retraction of the lower anterior teeth through springs and elastic. At the end of treatment, the patient has achieved Class I, except only the right side, which achieved molar ratio Class II. After a follow-up period of 2 years, the results remain stable. In this case in a patient with moderate facial asymmetry, it was possible to restore the smile esthetics only with tooth movement through the use of absolute anchorage of mini implants for distalization of molars and anterior teeth.

1. Introduction

In adult patients, the treatment options for Class III malocclusion depend on the skeletal discrepancy, facial profile, and patient's chief complaint. Cases with slight discrepancies may be treated through orthodontic camouflage, whereas severe cases require treatment in combination with orthognathic surgery [1–3].

In borderline cases, in which the facial profile is esthetically acceptable, good results may be obtained with orthodontic camouflage [1–4]. The commonly used biomechanics strategies for Class III camouflage are the use of facemask therapy for mesial movement of the upper teeth and Class III elastics, often associated with lip bumpers, sliding jigs, and multiloop archwires [5–9]. However, all of these mechanics rely on patient cooperation or have potential side effects [10,11]. In this context, skeletal anchorage through mini implants or mini plates increases the foreseeability of the results of the orthodontic treatment. The insertion of mini implants is a less invasive procedure and it is well accepted by patients, representing a good option for mild discrepancies. On the other hand, the insertion of mini plates is more invasive, but is required in cases of moderate discrepancies [4,9,12].

In this article, we report a case of a 36-year-old woman with a Class III malocclusion associated with an anterior and unilateral posterior crossbite and deviation of the mandible and lower midline to the right side. The orthodontic treatment was based on the distal movement of the lower dentition and was achieved with skeletal anchorage provided by mini implants inserted into the retromolar area on both sides of the mandible. The final and 2-year follow-up records showed an attractive smile and normal, functional occlusion.

2. Diagnosis and etiology

A 36-year-old woman sought orthodontic treatment at the Department of Orthodontics of the Pontifical Catholic University of Rio Grande do Sul, Brazil, with the chief complaint of "wrong bite." The frontal facial analysis revealed a mandibular deviation to the right side and an increased lower third of the face. In the smile analysis, there was a greater display of the lower incisors instead of the upper incisors. A lower midline deviation to the right side

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Fig. 1. Pretreatment facial photographs.

(4 mm), associated with an anterior crossbite, worsened the unesthetic condition of the smile (Fig. 1). In the intraoral photographs and dental casts, we observed that second premolars and the left first premolar were absent in the upper arch, whereas in the lower arch, the right second and third molars were absent. In occlusion, the first molars showed a Class I relationship, but canines showed a Class III relationship. A posterior crossbite in the right side extended to the anterior region, including the central incisors. The lower arch had a negative discrepancy of 3 mm (Figs. 2 and 3). In the panoramic radiograph, the tooth absences were confirmed and all of the present roots were found to be in good condition. A lateral cephalogram and cephalometric measurements showed a skeletal Class I pattern with proclined upper and lower incisors (Fig. 4).

2.1. Treatment objectives

The main treatment objectives were as follows:

Eliminate the anterior and posterior crossbite.
Obtain a Class I canine relationship on both sides.
Obtain a molar Class I relationship on the left side and Class II on the right side.
Correct the lower midline.
Eliminate the crowding on the lower arch.
Improve the esthetics of the smile.

2.2. Treatment alternatives

Two alternatives were suggested for this patient. The first option was orthodontic decompensation followed by orthognathic surgery, with mandibular setback and correction of the deviation. This treatment plan would fulfill all the necessities of the case; however, facial esthetics was not the main complaint of the patient and the mandibular deviation was considered acceptable to her. Furthermore, we believed that the dental asymmetry caused by the skeletal deviation could be corrected through orthodontic movement without orthognathic surgery. Based on that, the orthognathic surgery was discarded. The second option was orthodontic camouflage, with extraction of the lower left first premolar with skeletal anchorage. Mini plates were first considered because the total time of treatment could be reduced, moving all teeth at once;

Fig. 2. Pretreatment intraoral photographs.

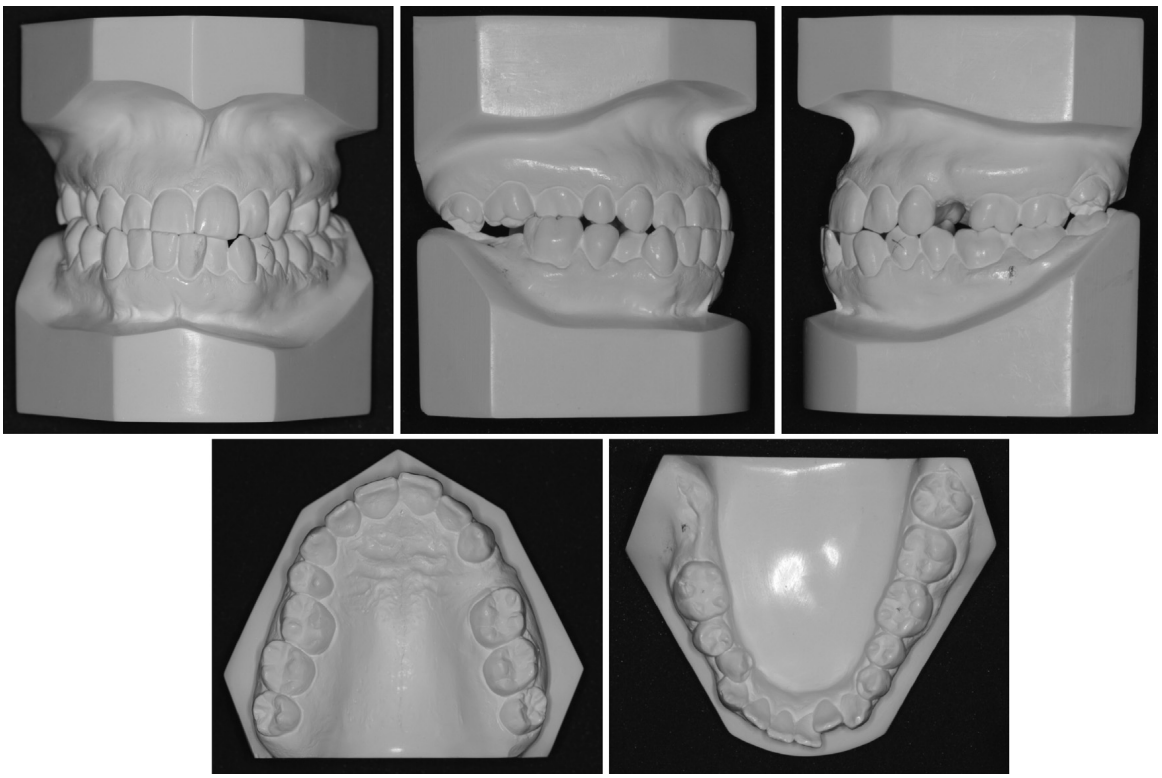

Fig. 3. Pretreatment dental casts.

however, the patient refused this option because of the complexity of the surgical procedures to insert and to remove mini plates. Therefore, mini implants were chosen as a good option, associated with lower extraction, to correct the asymmetry and anterior crossbite and reach an ideal overjet and overbite.

2.3. Treatment progress

To start the treatment, fixed 0.022 × 0.028-inch edgewise standard brackets were bonded on the upper and lower teeth, with the exception of the lower right first premolar. The extraction of the lower left first premolar and lower left third molar was requested. The initial alignment and leveling was performed with a stainless steel (SS) coaxial 0.0175-inch archwire, followed by round 0.016-inch, 0.018-inch, and 0.020-inch archwires. From the beginning, the upper archwires were expanded and the lower archwires were slightly contracted to correct the posterior crossbite. Mini implants measuring 1.3 × 7.0 mm (Neodent, Curitiba, PR, Brazil) were inserted into the mandible, distal to the right first molar, and into the left retromolar area (Fig. 5). At the right side, elastomeric chains were attached from the mini implant to the buccal and lingual surfaces of the first molar, which was moved distally, as was the second premolar. Then, with enough space, the first premolar was bonded and aligned. On the left side, the second and first molars and the second premolar were tied together to the mini implant, forming the anchorage unit for retraction of the canine with elastomeric chains (Fig. 5). After canine retraction on the left side, there was enough space for retraction of the lower incisors and correction of the deviated midline. The incisors were retracted with SS 0.018 × 0.025-inch archwire with bull loops to eliminate the anterior crossbite. In the maxilla, open coil springs were inserted between the left canine and left first molar, creating space for

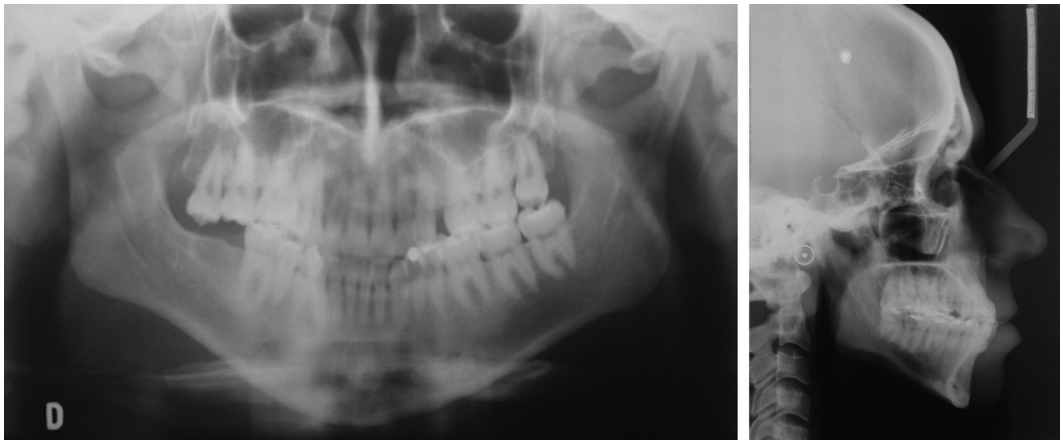

Fig. 4. Pretreatment radiographies.

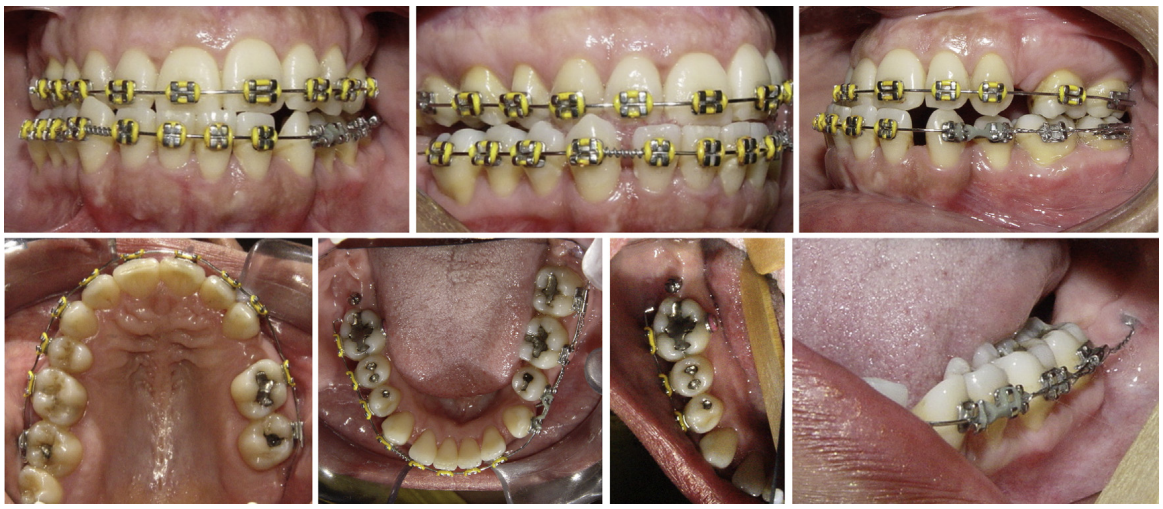

Fig. 5. Intraoral photographs of the mechanics. Mechanics on the lower arch after the distalization of the right teeth with elastomeric chains connected to the mini implant and buccal and lingual surface of each tooth and during the distalization of the left teeth with molars and premolars connected to the mini implant increasing the anchorage.

prosthetic implants in the first premolar area. During finishing, SS rectangular 0.019 × 0.025-inch ideal upper and lower archwires and one-eighth-inch elastics were used at the canine region to improve the intercuspation.

3. Results

At the end of treatment, the facial analysis revealed that the asymmetry of the mandible persisted, as expected; however, there was great improvement in the esthetics of the smile. The dentition now appears attractive, exhibiting a wider upper arch and a greater display of the upper incisors instead of the lower incisors (Fig. 6). Intraoral photographs and dental casts revealed that the treatment objectives were reached: the molars had a Class II relationship on the right side, a Class I relationship on the left side, and the canines were in a Class I relationship. Similarly, ideal overjet and overbite were obtained, anterior and posterior crossbites were corrected, and the upper and lower midlines matched. The upper right first and second molars were kept overexpanded at the end of treatment, preventing relapse during the retention period (Figs. 7 and 8). The panoramic radiograph showed parallelism of the roots without resorption. There was adequate space for implant-prosthetic rehabilitation in the region of the upper left first premolar. Final cephalometric measurements showed that the upper and lower incisors were uprighted and cephalometric superimposition highlighted the changes in the position of the incisors, in addition to the lower molar distalization and lower lip retraction in response to the retraction of the lower incisors (Fig. 9; Table 1). The 2-year follow-up control demonstrated excellent stability of the obtained results, with implant-prosthetic rehabilitation of the upper left first premolar (Fig. 10).

4. Discussion

When adult patients have an accentuated facial asymmetry or severe anteroposterior skeletal discrepancies, orthodontic treatment associated with orthognathic surgery is the primary choice [13]. However, when the facial asymmetry is considered slight to moderate, does not compromise the facial esthetics, or is not part of

Fig. 6. Posttreatment facial photographs.

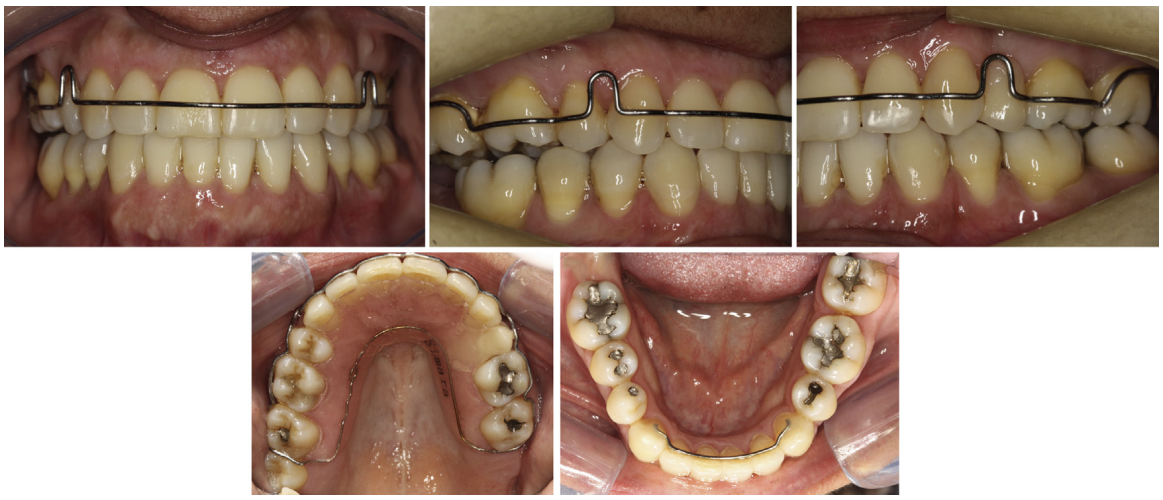

Fig. 7. Posttreatment intraoral photographs.

the chief complaint of the patient, orthodontic compensation may be indicated to obtain a harmonic smile and correct masticatory function [4,12,14,15].

Several treatment modalities have been proposed over the years with the intent of achieving distal movement of the upper molars; however, only a few descriptions have been found for the lower arch [10]. Among the alternatives for distal movement of the molars in the lower arch are lip bumpers, Class III elastics associated or not to sliding jigs, and the Nance lingual arch to improve the anchorage [4,9,10,16]. Nevertheless, all those mechanics depend on patient cooperation and provoke undesirable effects, such as anchorage loss, lower incisor proclination, and upper incisor proclination. Moreover, distal movement of the lower molars is reputed more difficult to perform than that of the upper molars [10,17]. In this context, skeletal anchorage arose as an excellent option, which brought a new paradigm to orthodontics. Recently, some authors described cases in which orthognathic surgery was avoided because the skeletal anchorage with mini implants or mini plates made camouflage possible with satisfactory results in esthetics or function [4,12,14,15]. In particular, the skeletal anchorage overwhelms the desirable orthodontic movements, eliminating the side effects [17].

In the case here described, the anteroposterior dental discrepancy was moderate; therefore, mini implants and plates were

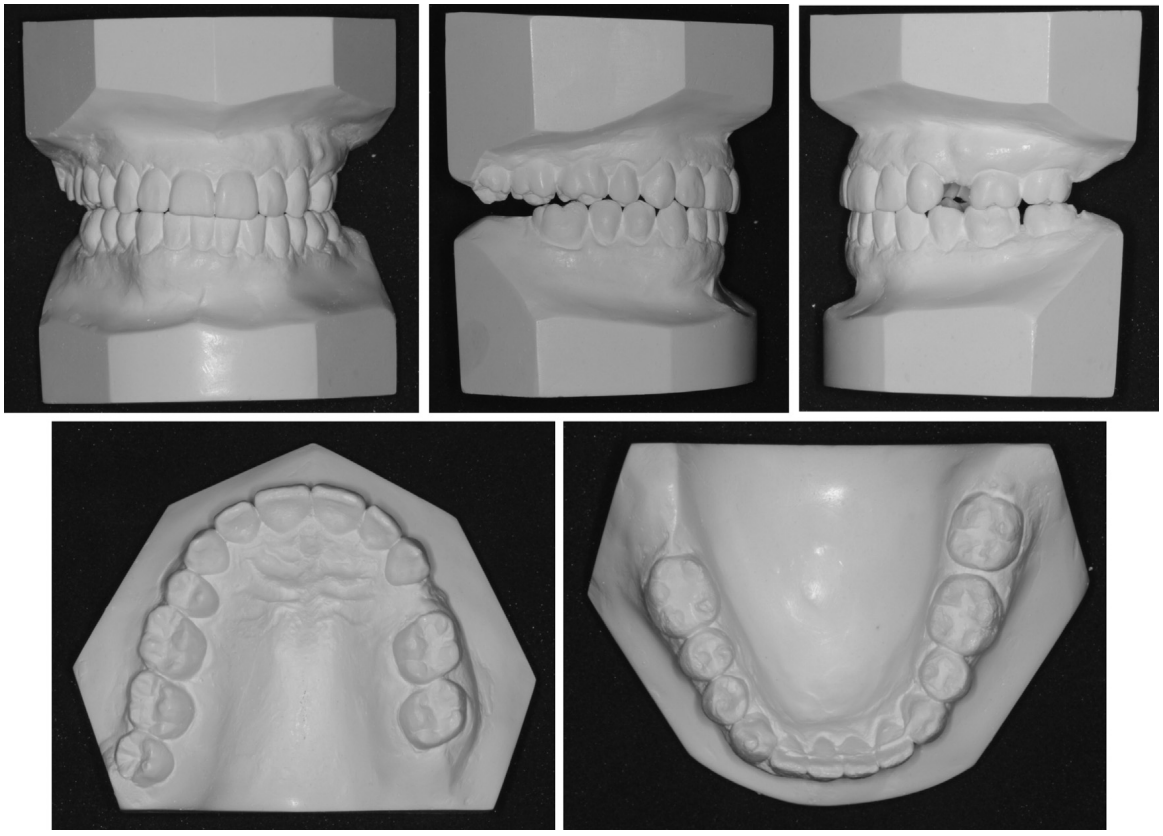

Fig. 8. Posttreatment dental casts.

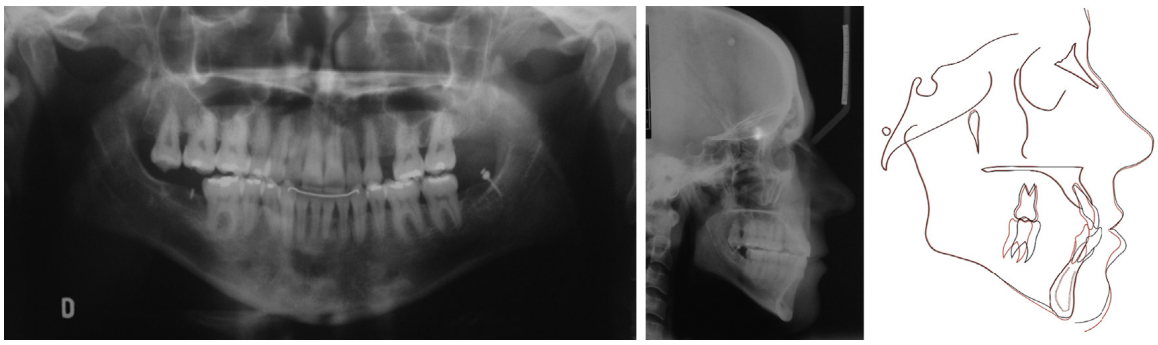

Fig. 9. Posttreatment radiographies, posttreatment cephalogram, and total superimposition.

considered as good anchorage units to camouflage this malocclusion. If elected, the mini plates would be placed on the external oblique ridge of both sides of the mandible. The major advantage of this would be the possibility of moving all the lower teeth at once, reducing the duration of treatment and eliminating the necessity of lower left first premolar extraction [18,19]. Nonetheless, the patient refused the mini plates because of the complexity of the surgery required to insert and remove the devices and opted for mini implants instead [19–21].

Different mechanics based on mini implants have been described for the correction of Class III malocclusions. Usually, mini implants are inserted between the first and second premolar roots or between the second premolar and first molar roots [4,11,12,15]. In cases in which there is not enough space available between the roots in the mandible, the mini implants can be placed on the upper arch, between the second premolar and the first molar, but this alternative relies on patient compliance regarding use of Class III elastics from the mini implant to the lower arch [12]. Another alternative, if there is enough space available, is vertical insertion into the retromolar area. The great advantage here is the possibility of larger movements without the risk of the mini implant contacting the roots. However, the disadvantage is the higher possibility of the mini implant becoming encapsulated by the gingiva, hindering both access and mechanics [12]. In the present case report, because there was no space between the lower posterior roots, we opted for insertion in the retromolar area, where spaces were provided by molar absence and extraction. One of the main concerns related to the Class III treatment through distal movement of the lower dentition is the stability of the results obtained. The lower teeth on the right side were moved distally. The lower left first premolar was extracted for midline correction and incisor retraction, provoking a reduction on the lower arch's length and perimeter, and also a reduction on the space available for the tongue, which could make this case unstable. As such, certain aspects must be observed in these cases to improve the stability after treatment: establishment of ideal overjet and overbite, good intercuspation, and use of a retainer on the lower arch indefinitely. Hopefully, the results obtained in this case remain stable, as shown in the 2-year follow-up control.

Table 1
Cephalometric measurements

Measurements	Norms (SD)	Initial	Posttreatment
Sella nasion to nasion point A	82° (3)	78	79
Sella nasion to nasion point B	80° (3)	75	77
Nasion point A to nasion point B	2° (2)	3	2
Facial convexity (NA.APog)	0° (2)	9	6
Facial angle (PoOr.NPog)	87° (3)	87	86
Y-Axis	59° (6)	61	62
Sella nasion to gonion gnathion	32° (3)	40	40
1.NA (°)	22°	26	22
1-NA (mm)	5 mm	7	6
1.NB (°)	25°	34	15
1-NB (mm)	5 mm	12	6
Inter-incisal angle	131° (5)	117	140
Ul-S line	0 mm (2)	5	−2
Ll-S line	0 mm (2)	−1	−1
IMPA	90° (4)	97	77
Frankfort mandibular plane angle	25° (3)	31	32
FMIA	65° (4)	52	81

NA.Apog, The angle between NA line and APog line; PoOr. NPog, The angle Frankfort plane and NPog line; 1.NA, The angle between upper incisor and NA line; 1-NA, The linear distance between the upper incisor buccal surface and NA line; 1.NB, The angle between lower incisor and NB line; 1-NB, The linear distance between the lower incisor buccal surface and NA line; UL-S line, The linear distance between upper lip and S line; LI-S line, The linear distance between lower lip and S line; IMPA, The angle between lower incisor and mandibular plane; FMIA, The angle between lower incisor and Frankfort plane.

5. Conclusion

In the case described, with moderate facial asymmetry, it was possible to obtain good smile esthetics and functional occlusion with orthodontic movements using the aid of mini implants as units of anchorage.

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Fig. 10. Intraoral photographs 2 years posttreatment.