



Surgical-orthodontic treatment of a severe skeletal class III malocclusion**

Tratamiento ortodóncico-quirúrgico en una maloclusión clase III esquelética severa

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ABSTRACT

25-year-old female patient attended the Orthodontics clinic of the Division of Post-Graduate Studies and Research of the Faculty of Dentistry, UNAM. The chief complaint was that she wanted to change her facial appearance. The facial clinical examination showed an increased lower third; a long oval-shaped face, a dolichofacial biotype, asymmetrical facial planes and disproportionate fifths. The smile arch was non-consonant; the smile was positive with a tooth exposure of 100% of the clinical crowns; the facial midline did not match the dental. The lateral and oblique view showed a concave profile, hypoplasia of the facial middle third, good anteroposterior chin projection, open nasolabial angle and a negative lip step. Intraorally, the frontal photograph revealed a slight deviation of the dental midlines, lingual position of the lower teeth, anterior crossbite and unilateral right posterior crossbite. The molar and canine class was III. The upper arch form was ovoid with crowding and lack of space of less than 6 mm. The lower arch was ovoid and showed mild rotations. Overjet was less than 6 mm and the overbite was minus 2 mm. Orthodontic treatment was performed in three phases: presurgical, surgical and postsurgical. In the presurgical phase dental decompensation was achieved and the patient was prepared for surgery. During the surgical phase, a high Le Fort maxillary advancement surgery with bilateral sagittal osteotomy and advancement genioplasty was made. In the postsurgical phase ideal occlusal relationships, in terms of canine and molar class, overjet, overbite and coincident dental midlines were obtained as well as a more harmonious profile.

Key words: Skeletal class III, orthognatic surgery, prognathism.

Palabras clave: Clase III esquelética, cirugía ortognática, prognatismo.

RESUMEN

Paciente masculino de 25 años de edad se presenta a la División de Estudios de Postgrado e Investigación de la Facultad de Odontología de la UNAM y el motivo principal de consulta es que quiere cambiar su aspecto facial. Al examen clínico extraoral, en el análisis de los tercios, el tercio inferior se encuentra aumentado, en vista frontal muestra forma de cara ovalada, alargada, dolicofacial, los planos asimétricos y los quintos faciales desproporcionados. Sonrisa positiva no consonante, exposición dental del 100% de las coronas clínicas, línea media facial no corresponde con la línea media dental. La vista lateral y oblicua mostró un perfil cóncavo, hipoplasia del tercio medio de la cara, mayor proyección del mentón, ángulo nasolabial abierto y escalón labial negativo. Intraoralmente de frente se observó ligera desviación de las líneas medias, dientes inferiores lingualizados, mordida cruzada anterior y posterior unilateral derecha. Clase III molar y canina derecha e izquierda. Arcada superior de forma ovoidal, presentó apiñamiento y falta de espacio de menos 6 mm. Arcada inferior de forma ovoidal y ligeras rotaciones. Sobremordida horizontal de menos 6 mm y sobremordida vertical de menos 2 mm. El tratamiento ortodóncico se llevó a cabo en tres fases: prequirúrgica, quirúrgica, postquirúrgica. En la fase prequirúrgica se descompensó dentalmente al paciente y se preparó para la cirugía. En la fase quirúrgica se realizó una Le Fort alta de avance, osteotomía sagital bilateral y genioplastia de avance. En la fase postquirúrgica se lograron relaciones oclusales ideales, términos de clase canina y molar, resalte, sobremordida y las líneas medias dentales coincidentes, así como un perfil más armónico.

INTRODUCTION

When the patient's orthodontic problems are so severe that even growth modification or camouflage is not a good solution, surgical realignment of the jaws or repositioning of the dentoalveolar segments is the only possible treatment. In this type of patient, surgery is not a substitute for orthodontics, but must be properly coordinated with it and with other dental treatments in order to achieve acceptable overall results. Advances in recent years have made it possible to combine

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these treatments to correct many serious problems, which could not be treated years ago.¹

Tweed² in 1966 classified class III malocclusion into 2 categories; dental and skeletal: category A is defined as a pseudo-class III and category B is defined as a skeletal class III either by mandibular overgrowth or maxillary growth deficiency or a combination of both.

Skeletal class III malocclusion is a position disharmony between the maxilla and the mandible that distorts facial aesthetics and chewing function.³ Etiology is multifactorial including genetic and environmental factors.⁴

Proffit et al⁵ reported that 20% of orthodontic-surgical patients have excessive mandibular growth, 17% have maxillary deficiency and 10% have both.⁵ Approximately 4% of the population has a dentofacial deformity that requires orthodontic-surgical treatment to correct; the most common cause is a severe skeletal class III.⁶

In order to assess the discrepancy between the jaws, Jacobson presented the Wits appraisal with the aim of diagnosing the degree of severity of the antero-posterior disharmony of the maxilla in relation to the mandible.⁷ Recent studies conclude that surgical patients can be distinguished from non-surgical patients basically by using the Wits appraisal, the Gonic angle and Sella-Nasion distance.⁸

The diagnosis and treatment plan is of utmost importance, not all patients with dento-skeletal disorders are candidates for orthognathic surgery since any treatment of choice is irreversible for the patient.⁹

Holdaway stated that using only hard tissue analysis was inadequate to establish a treatment plan. He suggested that orthodontic changes should be done the other way around, that is, that the best possible soft profile should be established first and then the necessary dento-skeletal movements should be calculated to develop the ideal relationship of the profile, always considering the biological limits. The current perspective is to emphasize soft tissue analysis and make skeletal and dental movement decisions based on the patient's aesthetics.¹⁰

Ackerman and Proffit point out that soft tissue in its broadest sense, not only of the face, limits the therapeutic possibilities. Orthodontics has its limitations and often requires surgical assistance. The main objective of orthodontic-surgical treatment is to obtain an adequate facial (aesthetics) profile, occlusion and function.¹¹

Class III patients with a significant skeletal discrepancy are generally treated with orthognathic

surgery either of the maxilla, mandible or both in conjunction with orthodontic treatment.¹² Johnston *et al* declared that orthodontic-surgical treatment in class III patients has a high success rate.¹³ Therefore, coordination between the orthodontist and maxillofacial surgeon in the diagnosis and treatment plan is of paramount importance.¹⁴

CASE REPORT

Case report: A 25-year-old male patient attended the Division of Postgraduate Studies and Research of the Faculty of Dentistry of the UNAM. The main reason for his consultation was that he wanted to change his facial appearance.

Clinical characteristics: facial clinical examination: in the analysis of the thirds the lower third was increased; the frontal view showed an oval, long face; dolichofacial biotype; asymmetrical planes and disproportionate facial fifths. The smile was positive, with a non-consonant smile arch; dental exposure of 100% of the clinical crowns and the facial midline did not match the dental midline. The lateral and oblique view showed a concave profile, hypoplasia of the middle third of the face, increased chin projection, open nasolabial angle and negative labial step (*Figure 1*).

Intraorally from the front view, a slight deviation of the midline, lingualized lower teeth, anterior and posterior unilateral right crossbite was observed. Molar and canine relationship was class III on the right and left sides.

The upper arch had an ovoid shape, crowding and lack of space of -6 mm. The lower arch was ovoid-shaped and presented mild rotations. Overjet was -6 mm and overbite was -2 mm (*Figure 2*).

Pretreatment radiographic records included lateral headfilm, orthopantomography and a posteroanterior radiograph (PA). In the orthopantomography, good bone height was observed, the crown - root ratio was 2:1 and the upper right third molar was present. The condyles were elongated so we decided to perform the Thilander analysis to assess the proportion of the right and left mandibular ramus. It was of minus 2 mm; it was determined that the patient was slightly asymmetric. The cephalometric analysis revealed a severe skeletal class III due to prognathism; vertical growth, moderate dolichofacial biotype, proclined upper incisor and retroclined lower incisor (*Figure 3*). In the frontal analysis we determined that the maxillary-mandibular width corresponded to the facial width of the patient. Functionally, there was no evident articular problem.

Treatment plan. Orthodontic-surgical treatment. Inter-consultation was made with the Department of Oral and Maxillofacial Surgery of the Division of Postgraduate Studies and Research of the UNAM for

the extraction of the upper right third molar and first upper premolars. The treatment consisted of three phases: presurgical orthodontic phase, surgical and post-surgical orthodontic phase.

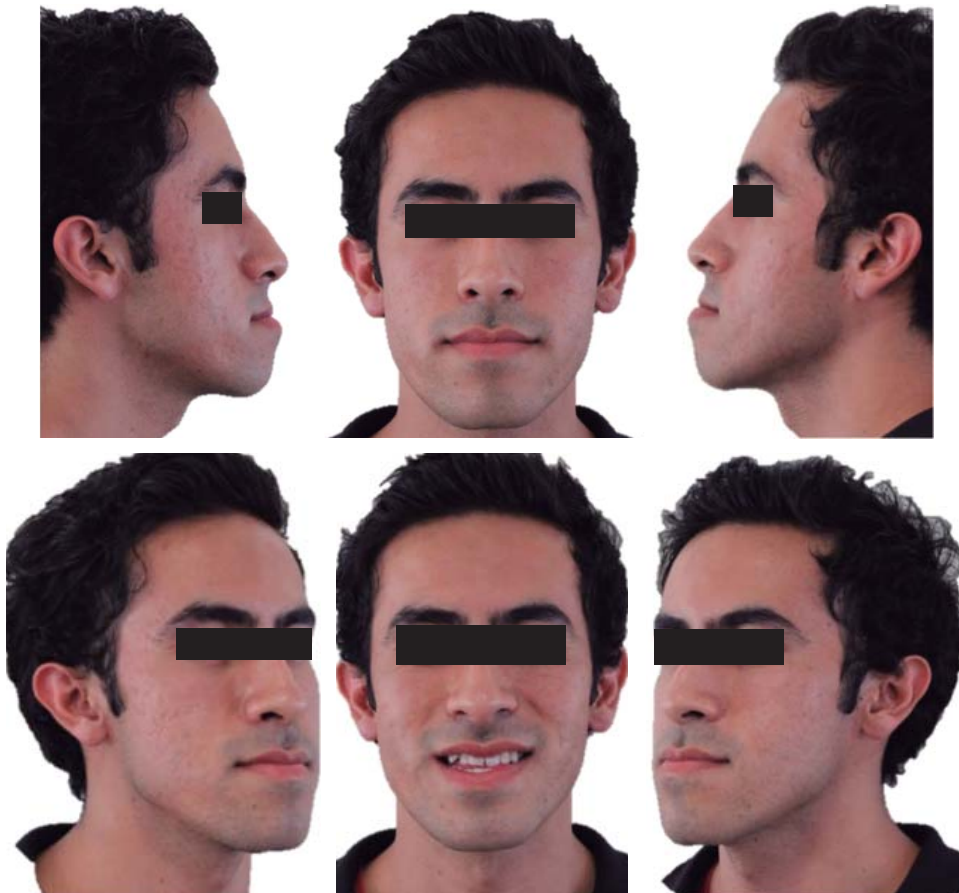


Figure 1.
Initial facial photographs.



Figure 2.
Initial intraoral photographs.

Presurgical orthodontic phase. A VTO was performed as well as an initial TPQ using the Nemoceph software. Based on these, a treatment plan was suggested to the patient. Roth 0.022" appliances were placed. Alignment, leveling, and light second and third order movements were made with an archwire sequence that began with a 0.014" NiTi and increased in caliber up to a 0.017" x 0.025" SS. Subsequently, the anterosuperior segment was retracted with a 0.019" x 0.025" SS DKL archwire thus achieving pre-surgical consolidation.

The case was re-studied, facial photographs were taken and the corresponding cephalometric analyses were performed (*Figures 4 and 5*).

Surgical phase. In coordination with the Department of Oral and Maxillofacial Surgery, an immediate presurgical evaluation was performed to determine the type of surgery; the final TPQ, model mounting and model surgery were made. We opted for an orthognathic surgery that consisted of three procedures: high Le Fort advancement osteotomy of 6 mm, bilateral sagittal osteotomy of the ramus with 7 mm retroposition and a 6 mm advancement genioplasty. Rigid mini plates were used for fixation (*Figure 6*).

Post-surgical orthodontic phase. The postsurgical control was immediate and we performed it together with the maxillofacial surgeons. After two months the surgical archwires were removed and changed to a 0.019" x 0.025" NiTi. Afterwards, a 0.019" x 0.025" stainless steel archwire was placed. A control X-ray was taken to observe root parallelism; the brackets were repositioned and post-surgical consolidation was performed with a 0.019" x 0.025" SS archwire. Occlusal settlement was achieved with braided archwires. For retention, a bimaxillary retainer was indicated: a nocturnal reverse Bionator and an upper and lower circumferential retainer during daytime. Post-treatment X-rays were taken and treatment changes were evaluated by means of superimposition. Before and after treatment cephalometric values were compared. The duration of treatment was 29 months (*Figures 7 to 11*).

RESULTS

Treatment goals were successfully achieved by combining orthodontic and surgical treatment. The changes were facial, cephalometric and intraoral.

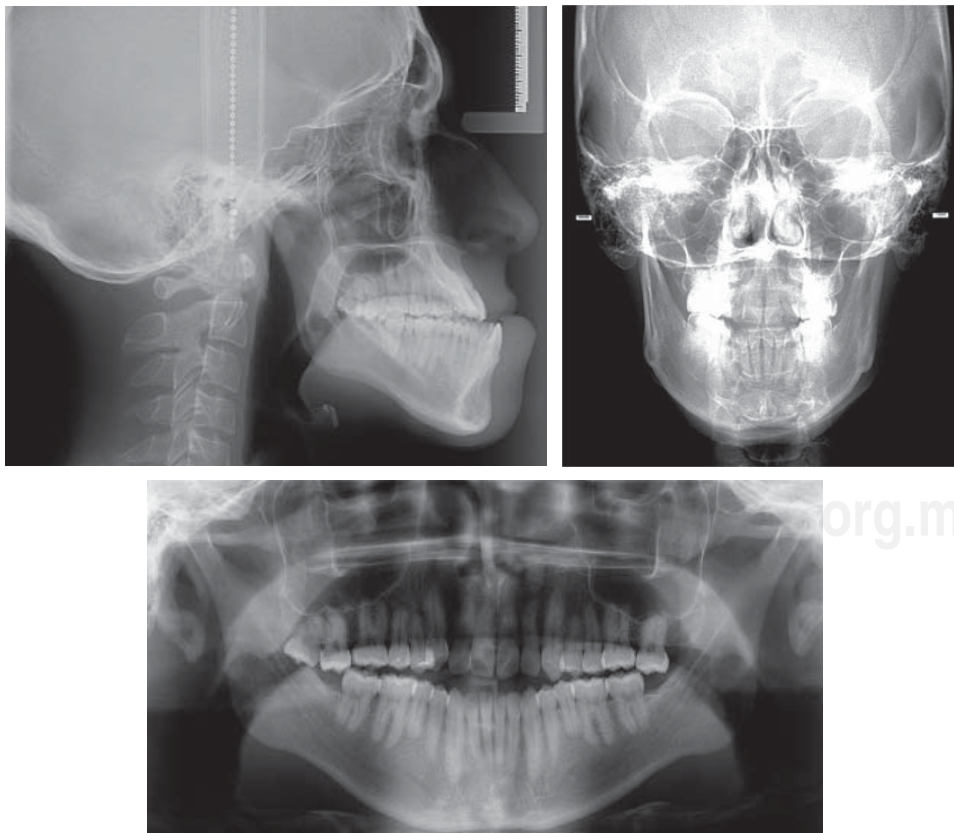


Figure 3.

Initial radiographs.

Facial frontal aesthetics. Facial harmony was obtained as well as a normal nasolabial angle; the upper lip showed good dentoalveolar support. A positive and very pleasant smile was achieved, with 100% of upper incisor display and 20% of the lower

incisors exposed. The facial midline matches the dental midline.

Aesthetic profile results. A straight, harmonious profile, with an adequate anterior projection of the middle third and greater volume in the zygomatic-malar

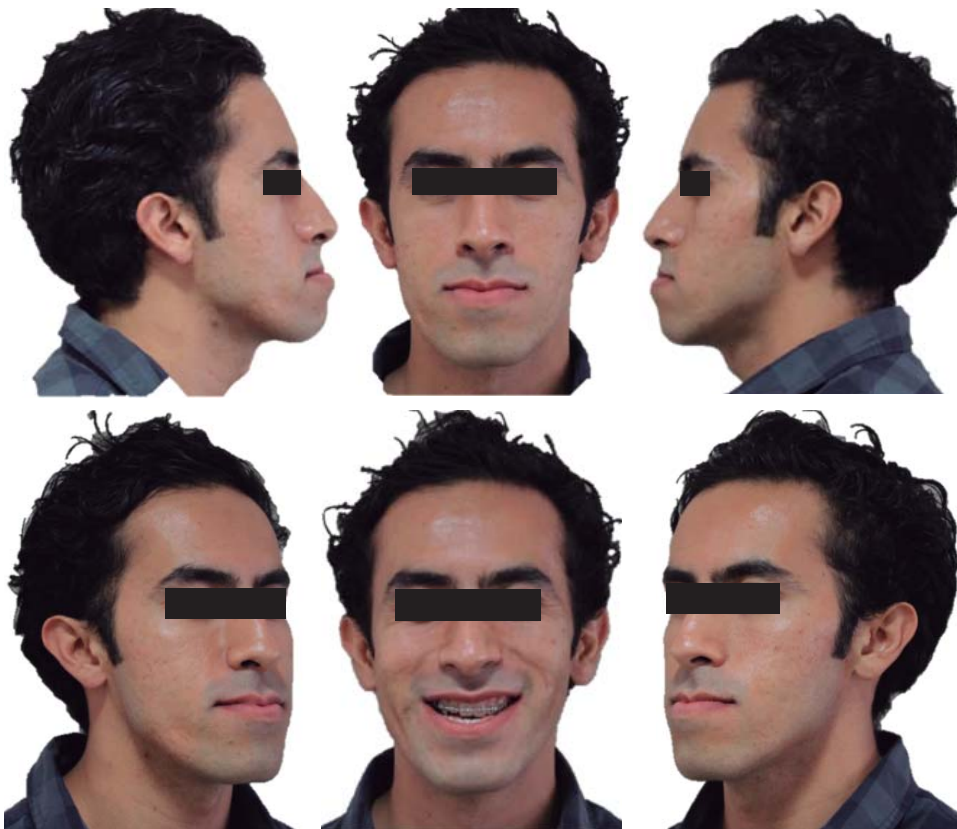


Figure 4.

Presurgical facial photographs.



Figure 5. Presurgical intraoral photographs.

area, as well as good upper and lower lip posture was obtained. The nasolabial and mentholabial folds were well defined as well as the mentocervical distance.

Intraoral results. Bilateral canine class I and functional molar class II were achieved. Normal overjet and overbite with centered dental midlines were also achieved.

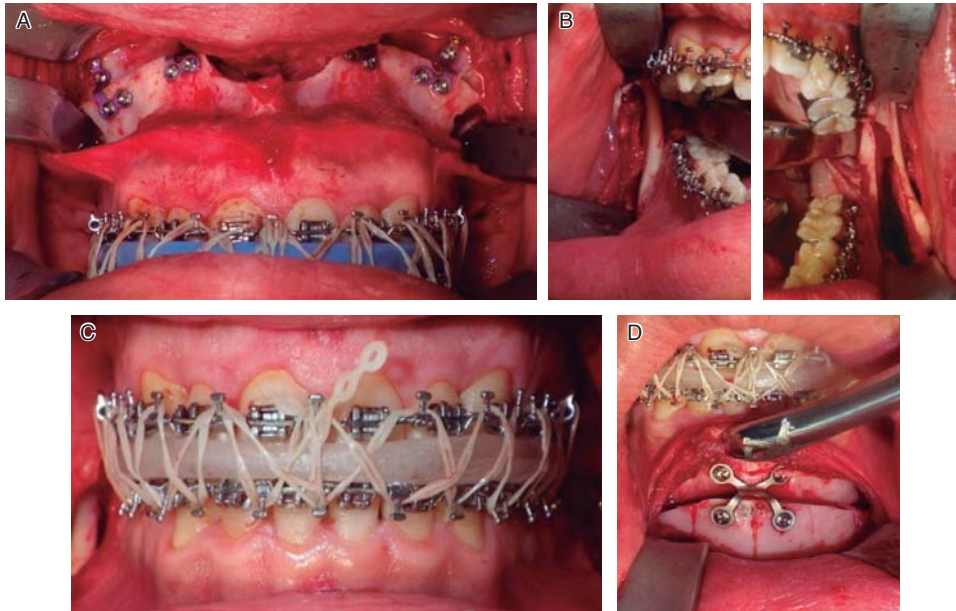


Figure 6.

Orthognathic surgery. **A.** High Le Fort advancement osteotomy with rigid fixation. **B.** Bilateral sagittal osteotomy of the ramus with mandibular setback. **C.** Final occlusal splint. **D.** Genioplasty.



Figure 7.

Final facial photographs.

Cephalometric results. Skeletal class I was determined with a -3 mm WITS value considering that the initial discrepancy was -15 mm. The vertical dimension decreased by 3°, with an initial mandibular

plane angle of 31° and at the end it was 28°. Incisor inclination was decompensated: the upper incisor with respect to the palatal plane had an initial inclination of 123° and it was correctly positioned within the basal



Figure 8. Final intraoral photographs.

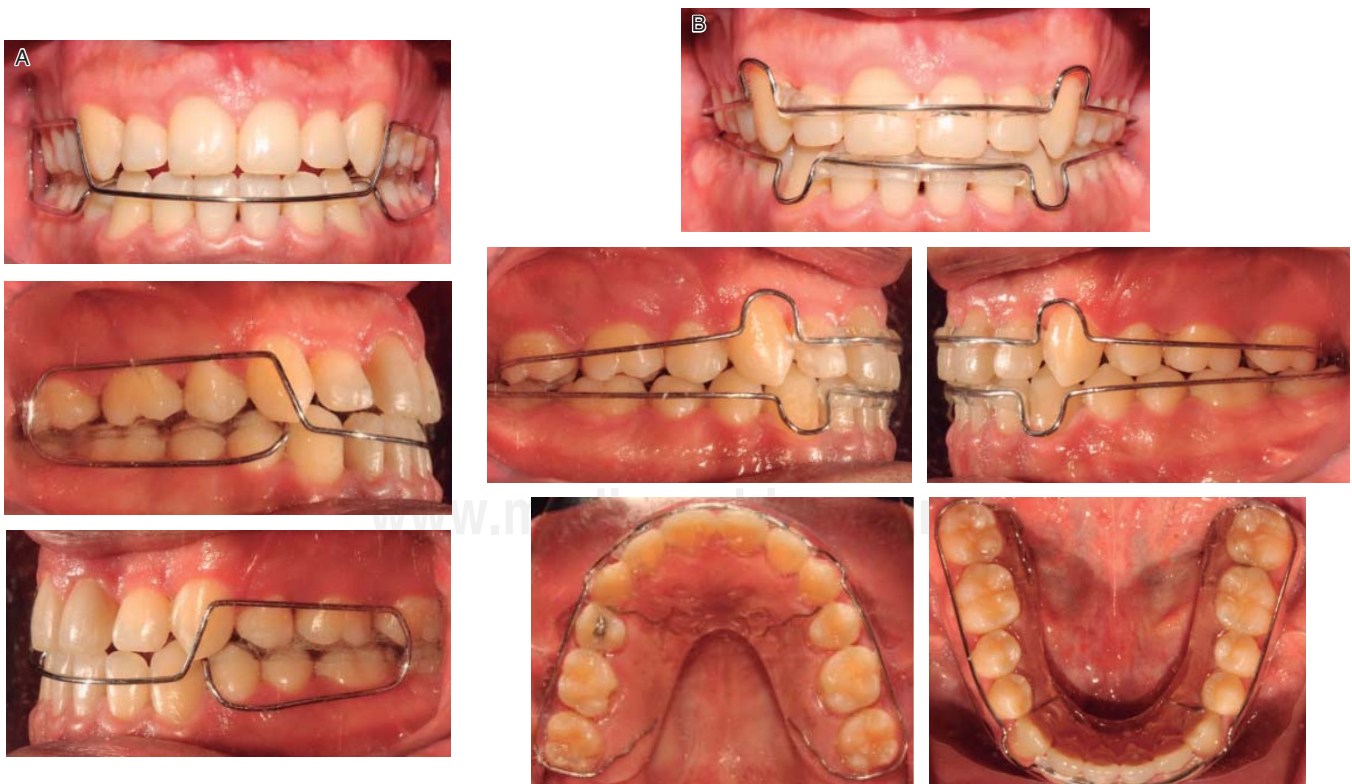


Figure 9. Retainers: **A.** Bimaxillary retainer, **B.** upper and lower circumferential retainer.

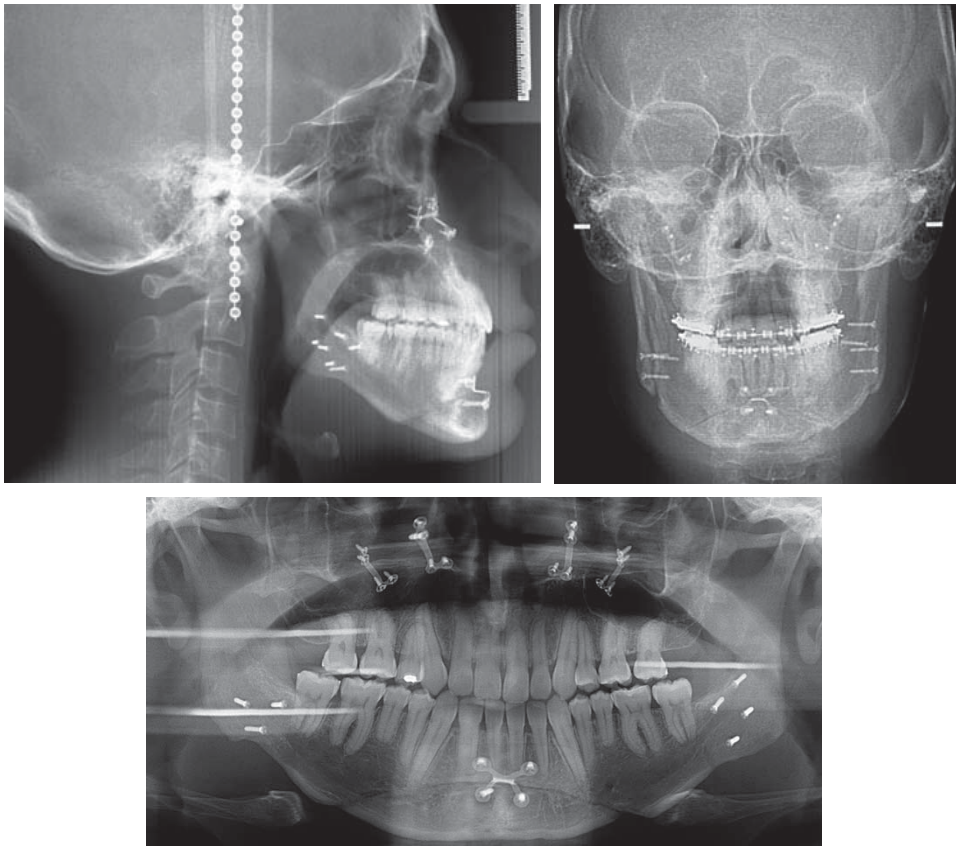


Figure 10.

Final radiographs.

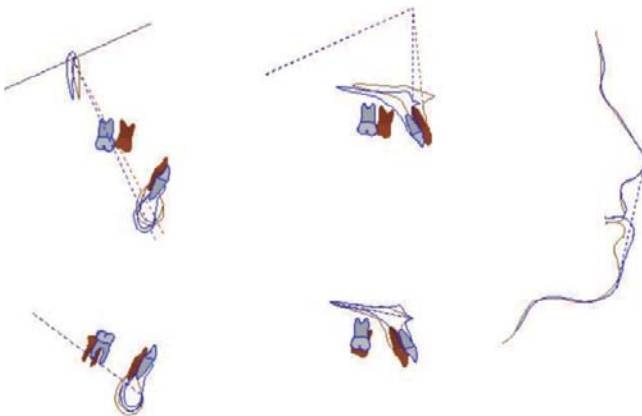


Figure 11. Superimposition.

bone with an inclination of 119°; the lower incisor was retroclined with an angle of 85° to the mandibular plane. The inclination was compensated to 89°.

DISCUSSION

During the diagnostic process, in order to expand the most common diagnostic records, video images will become more and more frequent. In this way, we

can have a record of the facial dynamics of our patients that will help us in the diagnosis and explanation of the treatment plan.¹⁰

Aesthetics of the soft tissues is undoubtedly one of the factors, perhaps the most important, that reflect the result of our treatment. But soft tissue is also one of our greatest limitations.¹¹

The objective of orthodontic-surgical treatment is to take the skeletal and dental relationships to normal and cephalometric measurements allow the scientific analysis of this relationship.¹⁵

A high Le Fort I osteotomy is favorable for the correction of maxillary deficiencies and lack of zygomatic projection. Also, the choice of sagittal osteotomies for mandibular reposition and advancement genioplasty provided a good mentocervical distance and normal mentholabial fold.¹⁶

Class III patients have greater mandibular stability if the surgical procedure is bimaxillary thanks to rigid fixation.¹⁴

CONCLUSION

Successful treatment requires proper planning based on a correct diagnosis and treatment plan, as

well as good interdisciplinary coordination in order to achieve optimal functional and aesthetic results and meet the patient's expectations.

As a treatment alternative, dental compensation is not recommended for severe dento-skeletal discrepancies.

Orthodontic-surgical treatment influences the psychological aspect of the patient improving his self-esteem and quality of life.

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