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Surgical Orthodontic Treatment for a Skeletal Class III Severe Vertical Patient with a Different Initial Treatment Plan in an Orthodontic Residency Program: Case Report

Montesinos A[1,*], Rivera G[1], Sánchez JC[1] and Ramirez R[2]

[1]Orthodontics Department, Postgraduate Studies and Research Division Dental, National Autonomous University of Mexico, Mexico
[2]Maxillofacial Surgeon, Department of Oral and Maxillofacial Surgery, Postgraduate Studies and Research Division, National Autonomous University of Mexico, Mexico

[*]Corresponding author: Montesinos A, Department of Orthodontics, Postgraduate Studies and Research Division, Odontology Faculty, National Autonomous University of Mexico, Mexico; Tel: +(525) 555542429; E-mail: amfortod_@hotmail.com

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Abstract

This article describes the treatment of a skeletal Class III severe vertical and asymmetric patient. The patient was treated in a university orthodontics program in two stages that represent the guidance of two different faculty members as the first instructor to start the treatment moved residency to another state. In the First Stage of treatment a Hyrax appliance and a reverse facemask with vertical control was used. In the second stage of treatment (change of faculty member guidance) two treatment alternatives were explained: conventional orthodontics to camouflage the skeletal anomaly and traditional orthodontics/orthognathic surgery approach; the surgical option was selected. Pre-surgical orthodontics was applied for leveling, aligning, and relieving dental compensations. A bilateral sagittal split osteotomy was performed for mandibular setback and a Le Fort I for maxilla advancement. Post-surgical orthodontics was applied for finishing and detailing occlusion. The second stage total treatment time was 24 months. Facial balance and harmony were enhanced, and a functional dental occlusion was achieved.

Keywords: Orthodontic treatment; Orthognathic surgery; Pre-surgical orthodontics; Post-surgical orthodontics; Skeletal Class III; Orthodontic program

Introduction

Many patients seek orthodontic treatment in orthodontic programs around the world. These programs depend on the continuing education, research, expertise, and teaching skills of their faculty members. Dentistry has evolved and different approaches are available for the practitioner and patient to solve a specific problem or clinical situation; in orthodontics different philosophies and mechanics can accomplish same treatment goals. In an orthodontic program residents learn and apply different ways to achieve contemporary orthodontic objectives; faculty members may share the timing or the way to treat a specific orthodontic problem or not, treatment planning in orthodontics includes an ideal orthodontic plan and in some cases treatment alternatives.

Case Report

One faculty member started the case but moved to another state, so the patient was reassigned to another instructor. The case is described in two stages that represent the different instructor's supervision and approach to the case.

First stage

A male patient came to the University orthodontic department with chief complaint of an" anterior crossbite and crowding". The

patient was 15 years old, a student and had no significant medical history. The pretreatment records showed a Class III skeletal relation (retrusive maxilla), dentofacial asymmetry (laterognathia), mild retroclined lower incisors, and a severe vertical growth pattern (Table 1, Figure 1), there was no information about the carpal Rx but we assume the patient had growth potential because of an orthopedic approach was selected for the treatment. The panoramic radiograph showed lack of parallelism of the roots, agenesia of the lower right second premolar with the presence of the lower right second deciduous molar and diminished root length in all teeth (Figure 2). The dental findings were an Angle Class III malocclusion, anterior cross bite of -3mm, 1 mm of overbite, deviated mandible dentition to the left, moderate crowding in the upper and mild crowding in the lower arch (Figure 3 and Figure 4).

Table 1: *Cephalometric measurements.*

Measurement	Norm	Pretreatment	Post treatment
SNA	82°	74°	80°
SNB	80°	77°	76°
ANB	2°	-3°	4°
Go Gn-SN	32°	44°	46°
1-SN	102°	103°	97°
IMPA	90°	87°	83°

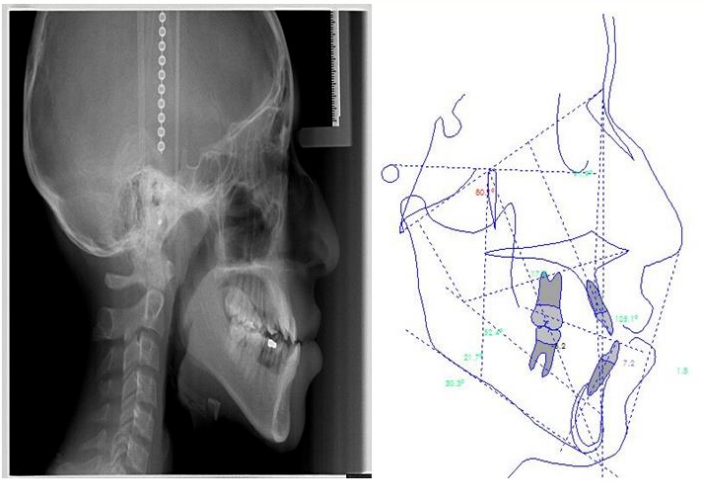


Figure 1: *Pretreatment lateral cephalogram and cephalometry.*

Figure 2: *Panoramic radiograph.*

Treatment plan was a two-phase approach; the first one was an orthopedic phase: Hyrax appliance in combination with a reverse facemask and micro-osteoperforations and the second a full orthodontic appliance phase.

The following information is reported in the treatment evolution record, but some important information was missing. A Hyrax appliance was bonded with soldered wires for the reverse facemask that was prescribed fulltime; the Hyrax appliance was activated every twelve hours for one week. At this time micro-osteoperforations procedure was scheduled for the maxilla. The reason or specific places for the perforations were not reported in the clinical record. The reverse facemask was worn fulltime for the next 5 months. At this point the instructor in charge moved to another state so another instructor was assigned to the case.

Second stage

The case progress was evaluated, and an overall assessment of the treatment was made; a new treatment approach was planned. The treatment objectives were to (1) achieve better facial balance (2) obtain a functional dental relationship, (3) eliminate the anterior crossbite, (4) eliminate the mandible deviation, (5) eliminate dental crowding in both arches, (7) maintain the root length of the teeth. Two treatment alternatives were explained to the patient with advantages, disadvantages, risks, and limitations. The first treatment alternative was a conservative non-surgical approach to camouflage the skeletal pattern; expansion in the upper arch and the extraction of the first lower first bicuspids and stripping of the lower incisors or an extraction of a central lower incisor to eliminate the anterior crossbite, but the posterior occlusion would not be ideal neither the future integrity of the periodontal tissue of the lower incisors. The second alternative was a traditional orthognathic surgical approach. A pre-surgical orthodontic phase to level and align, relieve dental compensations including the upper first bicuspid extractions and to coordinate the dental arches, the surgical procedure: maxilla advancement and mandibular setback and followed by a post-surgical orthodontic

phase for detailing. The orthodontic-surgical approach was selected.

Figure 3: *Pretreatment facial and intraoral photographs.*

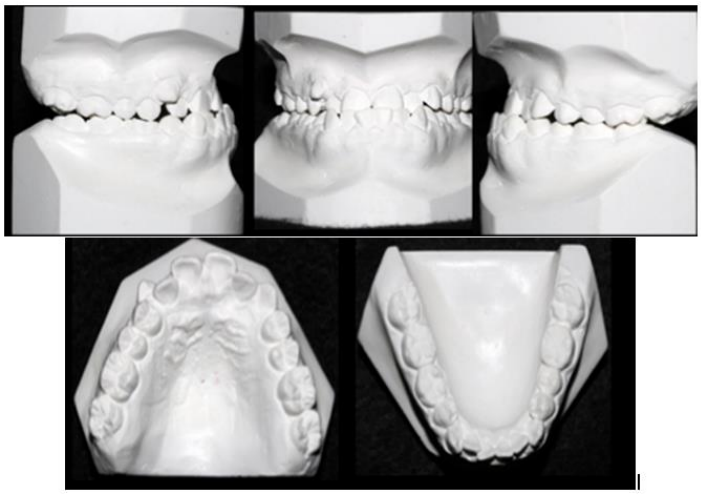


Figure 4: *Pretreatment study models.*

The MBT 0.022" x 0.028" appliance (3M Unitek, Monrovia, CA.) was bonded from second molar to second molar upper and lower (upper first bicuspid extractions were prescribed) and NiTi 0.012" upper and lower were engaged to level and align, followed by NiTi 0.014" and 0.016" for this stage. The following archwires were used in posterior appointments for one month: NiTi-Cu 0.016" x 0.022" upper and lower, Niti 0.017" x 0.025", Niti 0.019" x 0.025", SS 0.019" x 0.025", crimpable hooks were placed in the upper arch for the closure of the remaining extractions spaces by sliding mechanics.

A bilateral sagittal split osteotomy (BSSO) was performed for mandibular setback of 4 mm and titanium mini implants (14mm) were used for fixation (Figure 5). A Le Fort I osteotomy was performed, and the maxilla was advanced 7mm; Titanium mini-plates and mini-implants were used for fixation (Figure 5).

Full time wear of intermaxillary elastics after surgery was prescribed. The maxillofacial surgeon checked the recovery of the patient each week and three weeks later and orthodontic appointment was scheduled to start the post-surgical phase. A panoramic radiograph was taken to check root alignment and bracket repositioning, Niti 0.016" x 0.022" upper and lower archwires were engaged followed by Niti 0.019" x 0.025" and SS 0.019" x 0.025" for finishing and detailing. The retention protocol was upper and lower circumferential retainers 24 hours a day.

The second stage treatment approach time was 24 months and there were no surgical complications. Facial balance was improved, and the final occlusal relationship was very good. The patient was very happy with his smile the masticatory function was greatly improved and treatment goals were achieved. The panoramic film showed good root parallelism and no significant clinical root resorption (Figures 6-8).

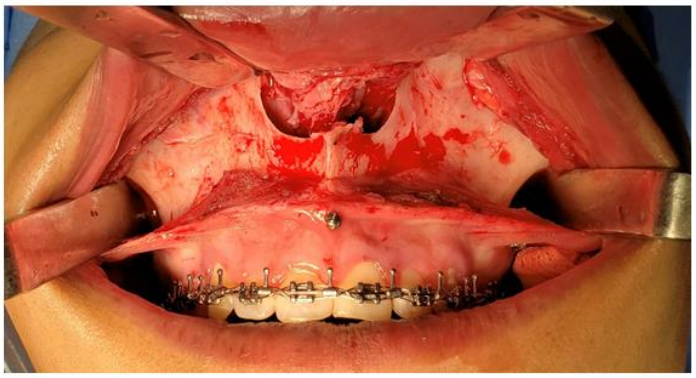
Discussion

Class III maloclussion treatment is a difficult challenge in everyday orthodontic practice. Early treatment is successful in some patients avoiding a surgical intervention but others don´t, although good patient compliance and treatment planning; some of them will require a surgical intervention or extractions to camouflage the skeletal discrepancy. Timing of orthodontic intervention can be controversial in respect of the success of treatment response and outcome [1]. The inability to predict mandibular growth is one reason why clinicians are reluctant to render early orthopedic treatment [2]. Protraction facemask therapy has been advocated in early of Class III malocclusion with maxillary deficiency [3-5].

Optimal treatment timing for facemask therapy is in the deciduous or early mixed dentition [2]. In this case the initial approach for treatment of class III malocclusion was a reverse facemask therapy. But the patient was in permanent dentition; some clinicians prefer to explode all remaining growth, but evidence shows a better outcome in an early stage. Patients receiving early orthodontic or orthopedic treatment might need surgical treatment at the end of the growth period [6]. This is the reason why an overall assessment was made, and a different treatment approach established.

An orthodontic surgical approach was chosen, and the next decision was to select a "Surgery First" or "Orthodontics First" approach. "Surgery First" provides immediate improvement of

facial appearance, rather than worsening it as it happens when eliminating dental compensations in an "Orthodontics First" approach [7-10].



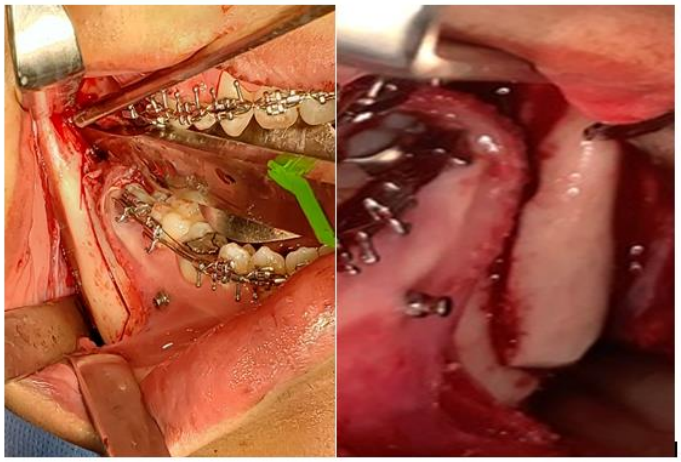


Figure 5: *Le Fort I osteotomy for maxilla advancement and bilateral sagittal split osteotomy (BSSO) for mandibular setback.*

Figure 6: *Posttreatment facial and intraoral photographs*

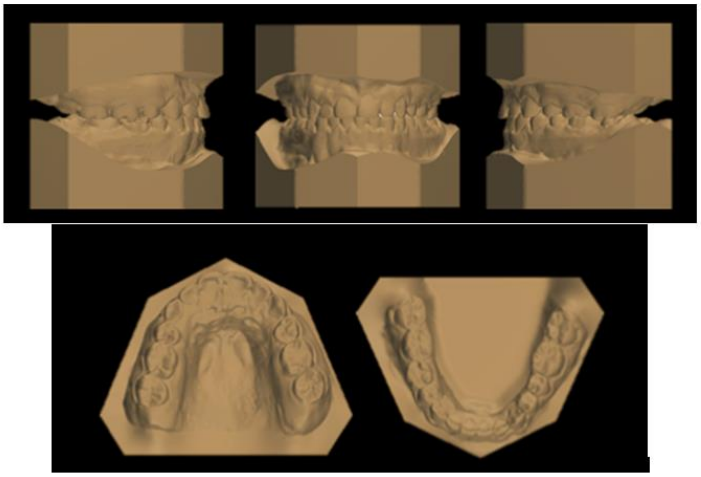


Figure 7: *Posttreatment study models.*

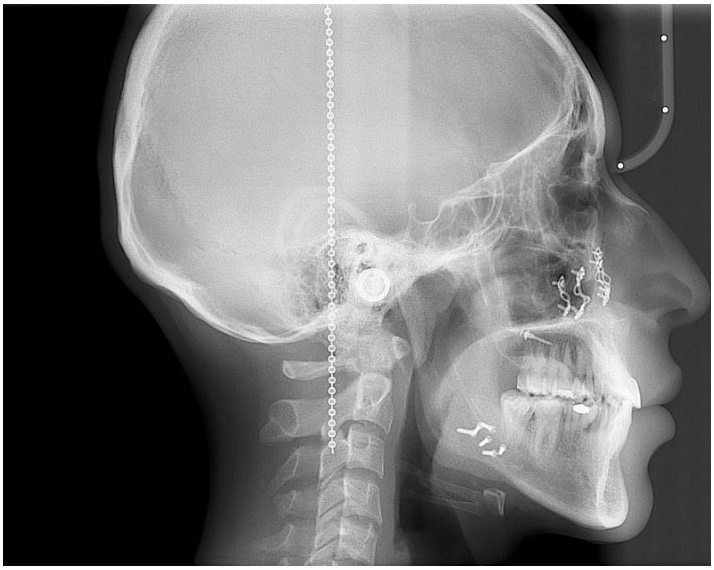


Figure 8: *Posttreatment radiographs.*

This burden was not a problem for the patient, so an "Orthodontics First" treatment plan was selected, and it was beneficial because remaining mandibular growth could continue before the surgical phase. Class III patients are difficult cases,

mandible growth can continue after orthodontic treatment. According to Johnston et al. the pre-surgical orthodontic decompensation of the dentition dictates de magnitude and type of surgical change and is a major factor in the success of treatment [11], Troy et al. found when comparing the incisor inclination in patients with Class III malocclusion treated with orthognathic surgery and orthodontic camouflage that the surgical correction was not maximized when pre-surgical incisor decompensation was not adequate [12].

The preoperative dental decompensation maximizes a stable postoperative occlusion [13,14]. The dental decompensation in our patient provided a good surgical correction improving facial esthetics and good function. Patient and family were very satisfied and happy with the treatment outcome.

There is not complete a definition of orthodontic education without comparison of different treatment protocols and approaches to the same orthodontic problem as demonstrated by this case; evidence based orthodontics must be the solid foundation for education in orthodontic programs as well in any continuing education activity. Every orthodontist must incorporate all available evidence to diagnose, plan and apply the best orthodontic treatment option and outcome.

Conclusions

Orthodontic therapy has evolved significantly with new treatment protocols, technology innovation, and new scientific data; the contemporary orthodontic quest is to achieve Function, Esthetics, Stability and Periodontal tissue integrity in every patient. There are different protocols or approaches to treat an orthodontic problem; treatment planning depends on the orthodontist training, philosophy, and experience. As in many health related sciences controversies in orthodontics may arise from different points of view or treatment preferences between specialists but as far as treatment objectives are achieved by healthcare professionals, they may choose a particular way to solve orthodontic problems based on evidence based scientific data.

Ethical Approval and Conflict of Interest

The authors declare that the patient was treated with all ethical approval; the informed consent was explained to the patient and patient´s family who signed. The authors declare no conflict of

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