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Case Report

Orthognathic Surgery for Treatment of Angle Class III Deformity - Clinical Case Report

Andréa Juliana Luz Perdigão*, Rubens Gonçalves Teixeira, Marilia de Oliveira Coelho Dutra Leal and Claudio Roberto Pacheco Jodas

Department of Maxillofacial Surgery and Traumatology, Sao Leopoldo Mandic, Campinas, Sao Paulo, Brazil

***Corresponding Author:** Andréa Juliana Luz Perdigão, Department of Maxillofacial Surgery and Traumatology, Sao Leopoldo Mandic, Campinas, Sao Paulo, Brazil.

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Abstract

Orthognathic surgery is performed to correct large discrepancies between the jaws and severe malocclusion, with a focus on improving facial function and aesthetics, providing a stable postoperative occlusion. A 23- year-old Caucasian female patient attended private outpatient care of Oral and Maxillofacial Surgery and Traumatology, by dentist Andréa Juliana Luz Perdigão, diagnosed with dentofacial deformity. The clinical dental examination, based on the concepts proposed by Arnett Gunson, revealed a Class III dentofacial deformity, a Class III occlusal relationship, anteroposterior maxillary deficiency, bilateral and anterior crossbite with mandibular prognathism. Two surgical stages (disjunction and after six months, orthognathic surgery) were proposed and chosen as a treatment plan by the patient. Six months after disjunction, bimaxillary orthognathic surgery was performed, with Le Fort I type osteotomy in the maxilla and bilateral sagittal osteotomy of the mandible. The Recommended movements were 0 mm lower maxillary repositioning, 9 mm maxillary advancement; 3 mm retrusion in the mandible. The objective of the present case report, functional and aesthetic, was successfully achieved through orthognathic surgery, the patient is in skeletal and dental Class I after the procedure.

Keywords: Maxilla; Le Fort I; Maxillary Osteotomy; Orthodontics

Introduction

Beauty references are variable and are greatly influenced by culture [1]. Proportionally, when facial esthetics becomes a main focus in orthodontics, dental professionals must improve their understanding of beauty "standards" in order to obtain the ideal smile profile for patients [2].

Orthognathic surgery is performed to correct large discrepancies between the jaws and severe malocclusion, with a focus on improving facial function and aesthetics, providing a stable postoperative occlusion [3]. Some surgeons made outstanding contributions to the development of orthognathic surgery [4].

In 1957 Trauner and Obwegeser incorporated the sagittal osteotomy of the ramus for dissection of the mandibular body, which resulted in a milestone of a new era, which enabled mandibular movement in three dimensions, keeping the condyle in the glenoid fossa and allowing contact between the stumps, facilitating the healing process; moreover, Obwegeser was the first to develop the Le Fort I osteotomy in order to move the maxilla in three dimensions [5].

The Le Fort I osteotomy is commonly used for vertical and horizontal maxillary movement [6].

William Bell proved experimentally, using a model, that orthognathic osteotomies are safe. In 1968, Hans Luhr published and developed the use of small plates for rigid stabilization of the craniofacial bones. Angle in 1887, was the first to relate malocclusion to a dentofacial deformity. In 1970, William Proffit highlighted the need for collaboration between orthodontist and surgeon to treat dentofacial deformities. Lawrence Andrews in 1970, recognized the importance of orthodontics to centralize the roots in the bone bases, and proposed mandibular osteotomies in order to obtain the ideal profile [4].

Invariably, patients who request orthognathic surgery are young patients who have symptoms related to malocclusion, with problems with speech, breathing, swallowing and associated psychological factors, due to physical appearance, such as low self-esteem [7]. A class I occlusion, facial harmony and improvement of the air space are essential for the result after orthognathic surgery,

since then, great advances have occurred in terms of technique and pre-surgical planning, mainly with regard to mandibular prognathism [8].

With the improvements in three-dimensional (3D) technology, orthognathic surgery has been updated, progressively performing more improved surgeries [9]. Virtual planning allows the design of orthodontic and surgical treatment to be revised and presented to the patient [10]. Images (3D) demonstrate better prediction of results and allow printing of specific surgical guides and devices for each patient, to improve the effectiveness of results [11].

In the 1980s, Andrews highlighted based on the second element that the glabella can be used as a reference mark for the correct anteroposterior positioning of the upper central incisors, thus preventing possible errors [12]. Still in the 1980s, according to Andrews, the correct anteroposterior position of the upper incisors is when, when descending a line in the glabella, this line touches the middle third of the buccal surface of the upper incisors [13]. Andrews analysis is probably an advantageous tool for orthognathic surgical planning [14].

Jaw retrusion can lead to decreased pharyngeal airway space, and is one of the most pathognomonic factors for mouth breathing and sleep apnea [15]. Counterclockwise changes in the occlusal plane optimize the profile and increase the airspace [16].

Surgical repair of a Class III occlusion can be accomplished by means of a maxillary advancement and/or mandibular setback [17]. Dental compensation in Class III malocclusion can be a treatment with low predictability for severe anomalies, in these cases orthodontic treatment associated with orthognathic surgery is indicated [18]. Le Fort I osteotomy concomitant with sagittal osteotomy is widely used to treat open bite. Studies demonstrate that orthodontic surgical repair for this purpose is safe, predictable and stable, with aesthetic gains and without compromising the airway. It is relevant to analyze the health of the temporomandibular joint (TMJ), as its impairment can affect the long-term surgical outcome. Principles must be adhered to in order to avoid a possible orthodontic relapse [19].

Case Description

Patient, female, leucoderma, 23 years old, attended private outpatient care of Oral and Maxillofacial Surgery and Traumatology, by dentist A.J.L.P., diagnosed with dentofacial deformity.

In the medical-surgical history, the patient reports having used, at the age of 15, an orthopedic device for expanding the jaw, according to the patient with no expansion success, and reports being a mouth breather, presenting snoring, pain, tinnitus and popping in the TMJs, swallowing and phonation difficulties, and dentofacial aesthetic complaints.

The clinical dental examination, based on the concepts proposed by Arnett Gunson, revealed a Class III dentofacial deformity, a Class III occlusal relationship, anteroposterior maxillary deficiency, bilateral and anterior crossbite with mandibular prognathism.

Initial occlusion

Figure 1: Initial occlusion

Figure 2 and 3: Initial occlusion

The orthodontic treatment plan was characterized exclusively by tooth alignment and leveling, with the aim of promoting adequate inclination of adjacent roots and correct positioning of teeth in the bone bases as a pre-surgical preparation. Two surgical procedures (disjunction and after six months, orthognathic surgery) were proposed and the patient opted for the treatment plan.

In the first surgical procedure, the patient underwent surgical expansion of the maxilla in September 2021, with the placement of a palatal distractor device, the expansion occurred adequately, in two months the distractor was removed in an outpatient setting.

Image from 2 months after surgical maxillary expansion

Figure 4: Occlusion after surgical maxillary expansion.

Photo of the palatal distractor in position

Figure 5: Follow-up after surgical maxillary expansion in October 2021.

Six months after the first surgical procedure, the treatment was analyzed using a model of the arches, and occlusal stability was observed between the arches. Then, a rectangular wire was installed before surgery, with hooks.

Preoperative photos

Figure 6: Panoramic X-ry.

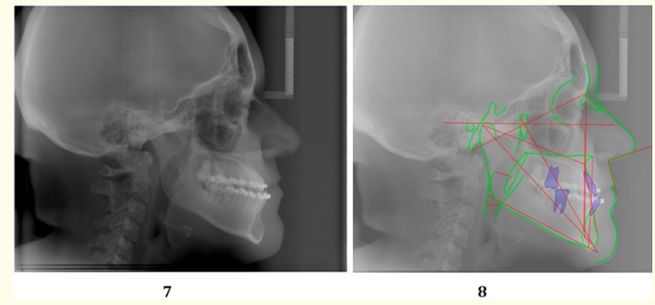

Figure 7 and 8: USP cephalometric analysis.

Cephalometric analysis of initial USP

Description	Result
SNA angle	79.12 degrees
SNB angle	83.78 degrees
ANB angle	-4.66 degrees
N-A.Pog angle	-11.79 degrees

Table a

Figure 9: Facial analysis.

Figure 10-12: Patient from the front, from the side and smiling.

In the previous planning, a facial analysis was performed in order to obtain a measurement for the advancement of the maxilla, a landmark was made in the glabella to descend a straight line and determine the anteroposterior distance between the upper central incisor and the line. The result of 9mm below the line in relation to the upper incisors was acquired. Using the software Dolphin 9.0® - Imaging and Management Solutions (Chatsworth, CA) virtual surgical planning was performed. The software provides possibilities to define the surgical planning of the case with more agility, benefit and accuracy.

The treatment design was conducted by bimaxillary orthognathic surgery, with Le Fort I type osteotomy in a step in the maxilla and bilateral sagittal osteotomy of the mandible (BSOM). The recommended movements were 0 mm lower maxillary repositioning, 9 mm maxillary advancement; in the mandible retrusion of 3 mm. To perform the surgical technique, an incision was made in the retromolar region and subperiosteal detachment of the mandibular sagittal osteotomy area on the right and left sides. BSOM and separation of the surgical stumps on the right and left sides, inflexible maxillomandibular block with a surgical guide, condylar positioning and stabilization with double straight plates and 2.0 system screws on the right and left sides. Removal of the blockade, surgical guide, suture of surgical accesses in the mandible with 4.0 monocryl thread on the right and left sides. Incision in the bottom of the maxillary sulcus between elements 14 (upper right first premolar) to 24 (upper left first premolar) and subperiosteal detachment of the maxilla and mucosa and nasal floor. Le Fort I step osteotomy (described by Wolford) and chisel revision of the osteotomy. Lowering of the maxilla and mobilization, inflexible maxillomandibular block, condylar positioning of the maxillomandibular complex with stabilization with two plates in "L" on the right and left side and two plates for zygomatic with the screws. Suture of the alar base with nylon 2.0 and suture of the maxillary mucosa (V-Y technique) with monocryl 5.0.

Postoperative photos

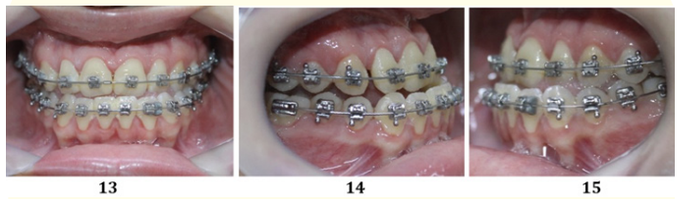

Figure 13-15: Bilateral frontal and lateral class III occlusion.

Figure 16: Panoramic X-ray.

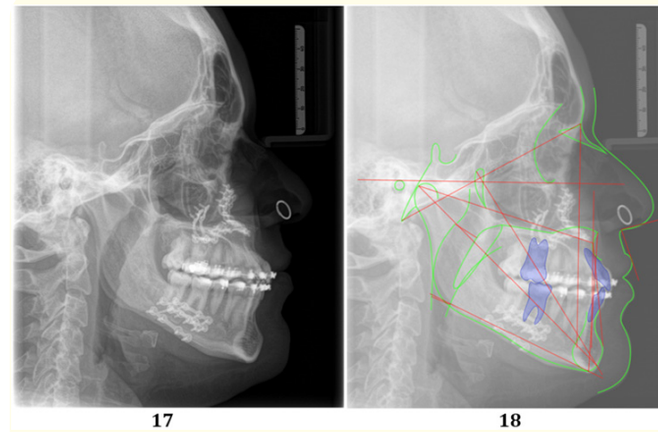

Figure 17 and 18: Cephalometric analysis of USP.

Cephalometric analysis of final USP - Summary Diagnosis

Description	Result
SNA angle	82.55 degrees
SNB angle	80.79 degrees
ANB angle	1.76 degrees
N-A.Pog angle	0.42 degrees

Table b

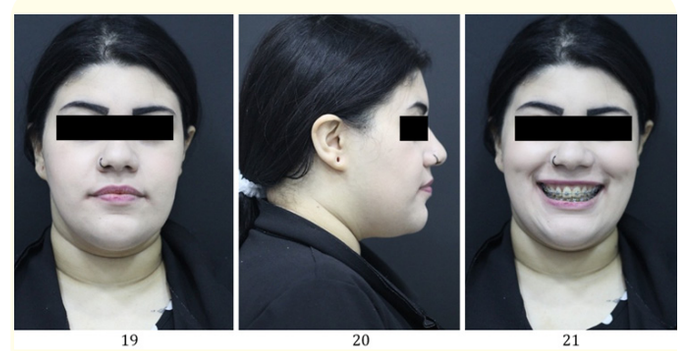

Figure 19 -21: Patient from the front, from the side and smiling.

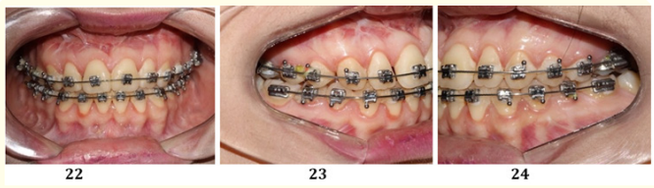

Figure 22-24: Bilateral frontal and lateral acquired class I occlusion.

The objective of this functional and aesthetic case report was successfully achieved through orthognathic surgery, the patient is in skeletal and dental Class I after the procedure.

Before and after photos

Overjet change from -5mm to 1mm.

Figure 25-26: Patient smiling.

Figure 27,28: Patient smiling laterally.

Discussion

A harmonious smile is the goal of any aesthetic-functional dental treatment [20]. In the present case, the patient presented for treatment with 1) transverse maxillary deficiency, 2) bilateral crossbite, 3) severe maxillary retrusion, 4) anterior crossbite, 5) facial disharmony associated with the concave profile. The need for orthodontic-surgical treatment was evidenced [21].

The maxillary transverse deficiency was corrected by uncrossing the bite bilaterally. Therefore, transverse maxillary gain was necessary in a first surgical procedure, with surgically assisted rapid maxillary expansion (SARME) using the skeletal palatal distractor, associated with surgical procedures of Le Fort I osteotomy and segmental osteotomy of the maxilla, the maxillary transverse gain was 04 mm after two months of activation of the breaker device. There was an increase in respiratory permeability. The bilateral crossbite was initially readjusted with SARME with transverse gain of 4 mm and then with orthodontic treatment by aligning and leveling the teeth [22].

The severe maxillary retrusion was corrected with the method of using 3D surgical treatment, which was relevant for the accurate prognosis of anteroposterior movements in the maxilla, with a 9 mm advancement, and 3mm retrusion in the mandible, in order to correct malocclusion of Class III [23,24]. The bimaxillary movements were performed to correct the deformity described below: In the cephalometric analysis of the initial USP, the patient presented the following angles: SNA angle of 79.12° which, according to clinical analysis, found that the maxilla was retruded in relation to the base front of the skull. After orthognathic surgery, the SNA angle was measured at 82.55°, and the ideal standard for this angle in Class I ranges from 80° to 84°degrees, soon it was verified that the maxilla had become well-positioned in relation to the anterior base of the skull [25].

The anterior crossbite was corrected with the orthognathic surgery itself, due to the advancement of 9 mm in the maxilla and retrusion of 3 mm in the mandible, with correction of the initial Overjet of -5 mm, which resulted in a real anterior gain of 6 mm and a 1мm post-surgical Overjet. As well as with orthodontic alignment and leveling prior to the surgical procedure [21]. The value obtained for the SNB angle in the initial USP analysis was 83.78°, which means that the mandible was protracted in relation to the anterior base of the skull, and the ideal standard for this angle is between 78° and 82°, after the During the surgical procedure, the new value obtained for the SNB angle was 80.79°, which validates that the mandible is well positioned in relation to the anterior base of the skull. The ANB angle obtained in the pre-surgical

USP analysis was -4.66°, which portrays that the patient was skeletal Class III, and the ideal standard for this angle is between 0° to 4°, after the surgical procedure the value obtained from the ANB angle was +1.76°, which shows that the patient is in skeletal Class I [25].

Facial disharmony was associated with poor positioning of the maxilla in relation to the skull base and was corrected with maxillomandibular repositioning, due to the adequacy of the N-A.Pog angle [26], which was initially obtained at - 11.79°degrees, certifying the presence of a concave profile , considering that, for a flat profile, the values must be between 0 and 2 degrees, after the surgical adaptation, the result of 0.42 degrees was reached, which shows a new acquired flat profile [27]. Facial harmony was achieved due to the correction of all the parameters mentioned above: 1) transverse maxillary deficiency, 2) bilateral crossbite, 3) severe maxillary retrusion, 4) anterior crossbite, 5) facial disharmony associated with the concave profile. The adjustment of the masticatory function in this case generated an aesthetic gain for the patient [23,28,29].

Conclusion

In the present case, the patient had a hyperdivergent craniofacial growth pattern, bilateral and anterior crossbite with a concave profile. Orthodontics combined with surgical maxillary expansion and orthognathic surgery is the indicated treatment option to obtain a stable occlusion and facial harmony in patients who present with maxillary retrusion and bilateral crossbite with severe class III discrepancies. In a precise and minimally invasive way, 3D planning proved to be an effective method in obtaining surgical predictability and effectiveness.

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