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Ortho Surgical Approach for Skeletal Class III with Maxillary Origin: A Case Report

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Abstract

Background: Although orthognathic surgery generally offers a significant improvement in dentofacial stability, individual factors can influence long-term results. **Aim:** To illustrate, through a clinical case, the management and the progression of the treatment of the class III skeletal anomaly with maxillary origin associated with a skeletal overbite and maxillary endo alveolus. **Observation:** The authors report the case of a 21-year-old female patient with a severe class III malocclusion associated with a maxillary endo alveolus causing severe aesthetic and functional damage. The patient's management initially consisted of a pre-surgical orthodontic decompensation phase, followed by bimaxillary orthognathic surgery to correct the vertical and anteroposterior disharmony. **Conclusion:** Orthognathic surgery appears to be advantageous, both functionally and aesthetically, enabling the results obtained to be long-lasting. The agreement between the orthodontist and the surgeon before, during, and after surgery remains crucial in the management of ortho-surgical cases.

Subject Areas

Dentistry

Keywords

Mandible, Maxilla, Ortho-Surgery, Prognathism, Classe III Malocclusion

1. Introduction

Class III dysmorphisms correspond to a shift in the maxillary and mandibular bone bases, with multiple clinical expressions. The most frequent clinical form is maxillary retrognathia and not mandibular prognathia, as previously thought [1]. The prevalence of these dysmorphisms varies according to country and ethnicity.

In Morocco, the prevalence is 10% [2]. They are significantly more prevalent in Asia, in countries such as Japan and Korea. In China, for example, the prevalence is 19.9% [3]. Although less widespread than other malocclusions, they are responsible for aesthetic damage with significant social and psychological repercussions [3]. In addition to the aesthetic problem, the misalignment of teeth and bone bases is disabling, leading to difficulties in chewing, breathing, and speaking [4]. Diagnosis of this anomaly is clinical and confirmed by radiological examinations. Cephalometric analysis, in particular architectural and structural analysis, enables a precise diagnosis to be made, and guides as to the etiology of this malocclusion [1].

The etiopathogenesis of Class III anomalies is the crossroads of genetic and functional factors. The most frequent etiologies are either dysfunctional, such as ventilation or swallowing problems, or para-functional, such as sucking tics [5].

Treatment of Class III malocclusion depends on the age and severity of the dysmorphosis. It is all the more effective if started early, in temporary dentition [6]. In adulthood, and in the absence of growth, treatment depends on the severity of the malocclusion; A mild Class III malocclusion accompanied by a satisfactory facial profile is typically treated with orthodontics alone, using camouflage techniques [6], with the ultimate aim of obtaining an acceptable occlusion, aesthetics, and function [7] [8] whereas in severe cases with an unacceptable facial profile and therefore very significant aesthetic damage, may be treated by orthognathic surgery, which may involve maxillary advancement, mandibular retreatment, or a combination of both, preceded by a phase of conventional orthodontic treatment.

We report the case of an 18-year-old female patient with a hyperdivergent skeletal class III, associated with maxillary retrognathia. Ortho-surgical management was indicated. Pre-surgical orthodontic preparation was followed by sagittal and vertical orthognathic surgery.

2. Patient and Observation

2.1. Patient Information

This is an 18-year-old female patient who presented to our consultation for aesthetic and functional damage, in apparent good condition.

2.2. Clinical Findings

Clinical examination showed a typical skeletal Class III facial pattern, with severe mandibular prognathism, retruded upper lip, procumbent lower lip, and increased lower anterior face heightand with a gap between the teeth (**Figure 1**).

Intraoral examination revealed (**Figure 2**):

- Maxillary endo alveolus with an anterior inverted bite and a gap from 25 to 15.
- V-shaped maxilla with lingual ectopy from 24 and 14.
- A parabolic mandible with slight anterior crowding and absence of the 36.
- Class III molar and canine relationships with anterior and transverse bilateral crossbites.

2.3. Radiological Examinations

Panoramic radiography confirmed the absence of the 36 extracted for endodontic reasons, as well as the presence of the 4 wisdom teeth retained for lack of space (Figure 3).

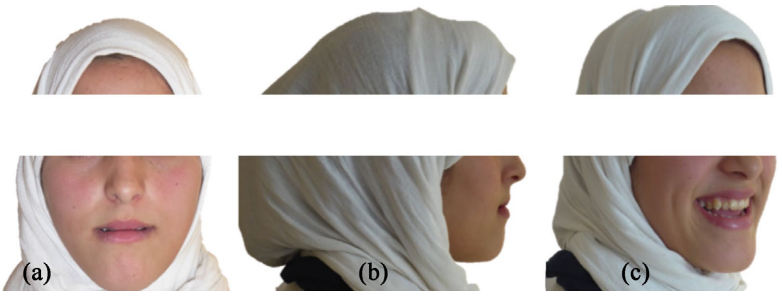

Figure 1. Frontal, profile, and three-quarter smile photographs before treatment.

Figure 2. Pretreatment intraoral photographs. Occlusion photos (a)-(c) and aerial views of the maxilla and mandible (d), (e).

Figure 3. Panoramic radiograph before treatment.

Cephalometric analysis revealed a reduced posterior facial height characterized by a short ramus, a high gonial angle, and a retroclined mandibular plane. The lower anterior facial height was proportionally increased. The maxillary central incisor was well-positioned relative to the basal bone, but the mandibular central incisor was lingually tipped, compensating for the anteroposterior discrepancy

(Figure 4, Table 1 and Table 2).

Both Steiner's and Tweed's analyses were performed on profile teleradiography. Cephalometric values are reported in Table 1 and Table 2.

Figure 4. Lateral cephalogram before treatment.

Table 1. Steiner Cephalometric analysis before treatment.

SNA	77˚
SNB	83˚
ANB	−6˚
SND	78˚
I/NA	21˚
I/NA	2 mm
I/NB	22˚
I/NB	3 mm
I/I	125˚
Pog/Nb	0 mm
GOGN/SN	42˚

Table 2. Tweed cephalometric analysis before treatment.

FMA	36˚
FMIA	59˚
IMPA	85˚
SNA	80˚
SNB	85˚
ANB	−5˚

Continued

AO-BO	−6 mm
Plan d'occ	14 mm
Angle Z	80˚
Upper lip	8 mm
Total chin	7 mm
Ht faciale post	35
Ht faciale ant	60
Index post/ant	0.58

2.3. Examination of Study Models

Examination of the casts revealed a 3 mm transverse dento-maxillary disharmony (DMD) and the curve of spee is flat (Figure 5).

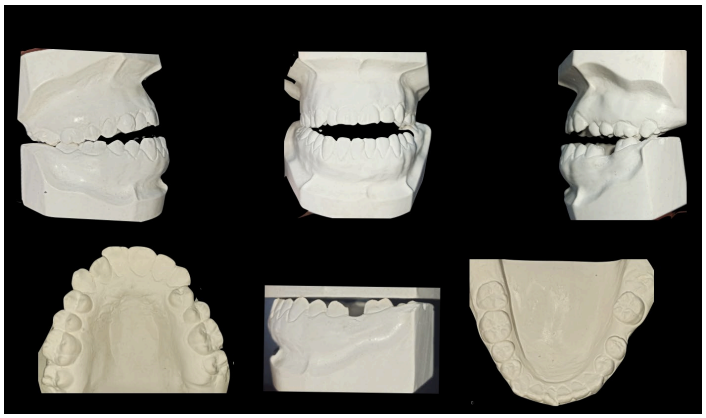

Figure 5. Pretreatment study models.

3. Diagnosis

The clinical examination and cephalometric analysis confirmed a skeletal Class III malocclusion with a vertical maxillary excess and skeletal open bite. Dentally, an Angle Class III malocclusion was present with inferior retroalveolar and superior normoalveolar.

4. Therapeutic Interventions

Our therapeutic objectives were to restore functional anterior and lateral dental articulation, as well as Class I canine and molar relationships while ensuring long-term stability of the corrections. To address the patient's reason for consultation and achieve the above objectives, we opted for a single-stage ortho-surgical treatment plan, with an orthodontic preparation phase to eliminate dentoalveolar compensation, followed by a second surgical phase to correct the sagittal and vertical anomaly, with extractions of 14 and 24, to maintaining the space of the extracted 36 for subsequent prosthetic rehabilitation (See Table 3 and Table 4).

Table 3. Steiner cephalometric analysis after treatment.

SNB	80˚
ANB	1˚
SND	76˚
I/NA	20˚
I/NA	4 mm
I/NB	24˚
I/NB	4 mm
I/i	130˚
Pog/Nb	2 mm
GOGN/SN	36˚

Table 4. Tweed cephalometric analysis after treatment.

FMA	30˚
FMIA	62˚
IMPA	88˚
SNA	81˚
SNB	80˚
ANB	1˚
AO-BO	+1 mm
Plan d'occ	12 mm
Angle Z	83˚
Upper lip	10 mm
Total chin	10 mm
Ht faciale post	40
Ht faciale ant	61
Index post/ant	0.63

Our treatment plan consisted of the following five phases:

The first orthodontic phase consisted of leveling the mandibular arch and reopening the space in 36. In the maxilla, after leveling, the canines and incisors were moved back to increase the anterior-posterior offset. The maxillary and mandibular arches were coordinated in preparation for the second surgical phase.

Post-orthodontic pre-surgical documentation (intra orale and facial views as well as profile teleradiography) clearly illustrates the result of this preparation (**Figures 6-9**). The panoramic radiograph taken at the end of this stage shows that both 38 and 48 have been extracted and that a good parallel relationship between the tooth roots has been achieved (**Figure 10**).

Figure 6. Intraoral view of the first orthodontic phase and mandibular alignment with the opening of the 36 spaces.

Figure 7. Intraoral view of second orthodontic phase canines and maxillary incisors retracted, sagittal and transverse dental compensations lifted with coordination of dental arches in preparation for orthognathic surgery.

Figure 8. Intraoralel view of the pre-surgical orthodontic phase placement of surgical arches.

Figure 9. Postreatment lateral cephalogram at the end of orthodontic preparation.

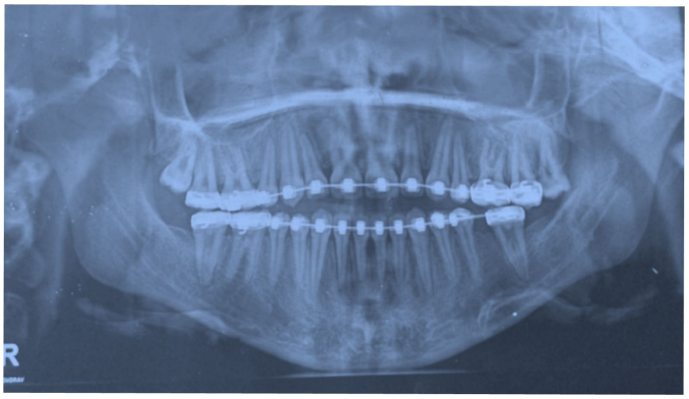

Figure 10. Panoramic radiograph at the end of orthodontic preparation.

The surgical procedure consisted of a Lefort I maxillary advancement combined with a sagittal osteotomy of the mandibular recoil ascending branches and a genioplasty to correct the vertical direction.

Post-operative follow-up provided psychological support until post-operative edema subsided and the patient recovered.

The post-surgical orthodontic phase of finishing and inter-cuspidation resulted in the installation of correct occlusion, overbite, and overhang, as well as Class I Angle canine and molar.

Intra-oral views and posttreatment study models show that the main problems were solved with the establishment of a right and left molar and canine Class I relationship and correct overjet and overbite. We removed the appliance and placed restorations from 12 to 22 in the maxilla and from 33 to 43 in the mandible as soon as our therapeutic objectives were deemed to have been achieved (**Figure 11**, **Figure 12**).

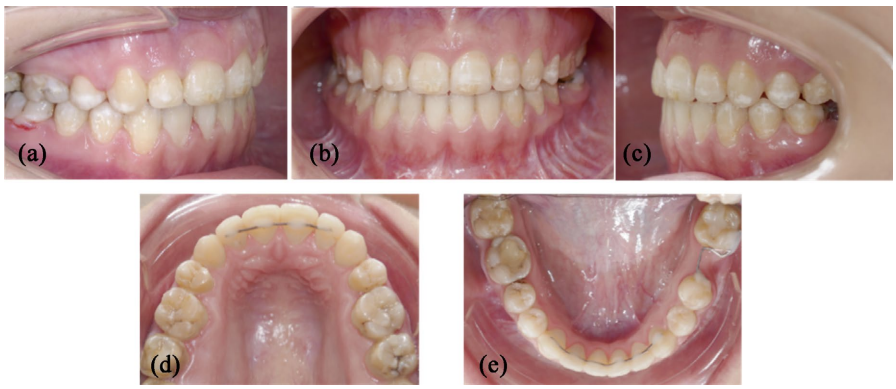

Figure 11. Intraoral view after treatment, Photos of the upper occlusion from left to right (a)-(c) and aerial views of the maxillary and mandibular arches from right to left, (d) and (e).

The surgery resulted in a marked improvement in profile and labial relationship, as well as harmonization of the smile. The extra-oral views demonstrate these satisfactory aesthetic results (**Figure 13**).

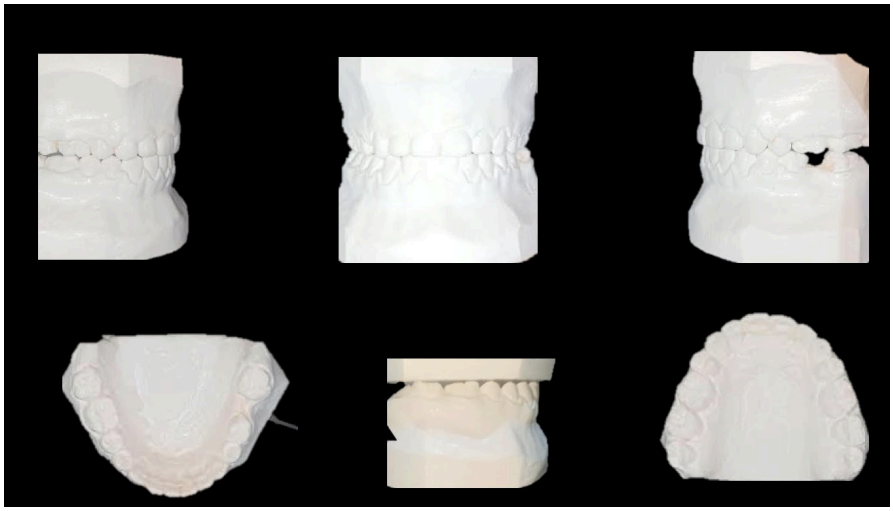

Figure 12. Post-treatment study models.

Figure 13. Frontal, profile, and three-quarter smile photos after treatment

"Pre- and post-treatment profile radiographs and superimposed cephalometric tracings clearly demonstrate the successful correction of the skeletal Class III malocclusion (Figures 14-16).

There was an increase in the skeletal shift of the maxilla and the teeth were aligned with their alveolar bone.

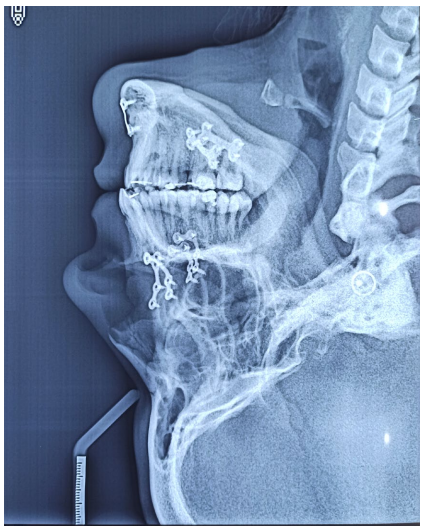

Figure 14. Postreatment lateral cephalogram.

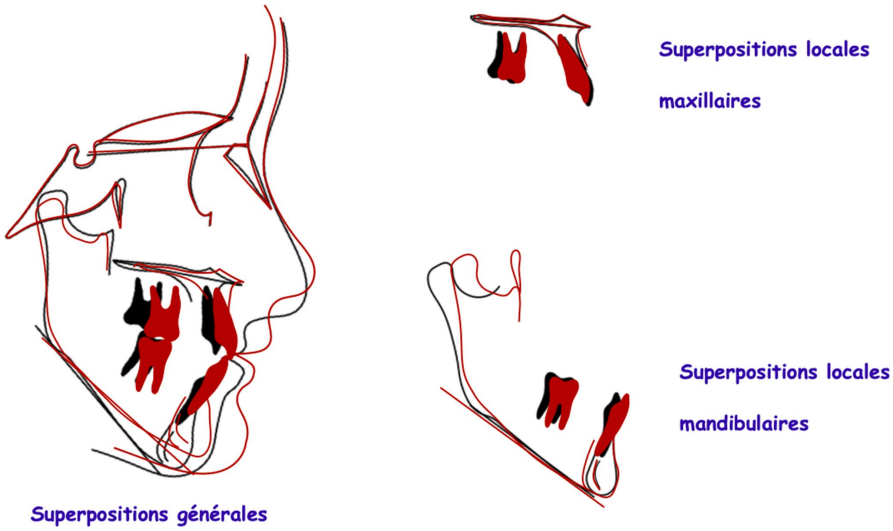

Figure 15. Superposition of initial and final tracings.

Figure 16. Postreatment panoramique radiograph.

5. Discussion

Orthodontic diagnosis and treatment planning for Class III malocclusion is essential, and depends on a number of factors [9]. In adults, and in the absence of growth, Class III skeletal malocclusion can be treated by orthodontic camouflage or ortho-surgical combination, the decision depending on facial aesthetics, the severity of the malocclusion and its impact on the patient, the anteroposterior position and inclination of the maxillary and mandibular incisors *i.e.* dento alveolar compensations; but also, the patient's acceptance of the chosen therapeutic option [3] [10].

In borderline cases, the therapeutic decision is quite difficult to take and depends largely on the benefit/risk ratio, based mainly on the clinical examination and cephalometric analysis [11]. However, our patient presented with an inverted bite with a negative overjet of -6 mm associated with a skeletal gap and facial hyperdivergence, as shown by the radigraphs and cephalometric analysis before treatment, contraindicating orthodontic treatment alone. Therefore, a combination of orthognathic surgery and orthodontic treatment was deemed appropriate.

In our case, orthognathic surgery consisted of a Le Fort I maxillary advancement

osteotomy to correct maxillary retrusion and a mandibular setback osteotomy combined with a genioplasty to correct mandibular prognathism and reduce vertical dimension. Before surgery, the treatment plan and outcome were discussed between the maxillofacial surgeon and the orthodontist. It's important to note that the orthodontist and surgeon must agree on the diagnosis, type of surgery, and orthodontic plan [12].

The term orthognathic surgery covers several procedures designed to re-establish normal relationships between the dental arches and their bony bases, with functional, skeletal, esthetic, and occlusal objectives [13].

This surgical technique is indicated for skeletal Class II and III malocclusions, anterior open bite, facial asymmetry, temporomandibular joint disorders, obstructive sleep apnea, cleft palate sequelae, and deformities or malocclusions caused by trauma [14]-[17].

The orthodontist's role in this context extends from the beginning to the end of treatment. It is important to note that the better the pre-surgical orthodontic preparation, the better the outcome of orthognathic surgery. This phase, therefore, consists of neuro-muscular preparation (management of any dysfunctions, parafunction), elimination of dental compensations that have arisen with dysmorphisms, alignment, control of spaces, harmonization and perfect coordination of the arches, and psychological support for the patient [18] [19].

Before surgery, in the pre-surgical treatment, the orthodontist sets up the surgical arches and prepares the aligners according to the programmed displacements. In our case, 2 splints were made: the first to advance the maxillary arch, and the second to retract the mandible. After surgery, in the post-surgical treatment phase, this lasts 6 to 9 months and enables the necessary occlusal finishing to be carried out, in particular, the establishment of canine and incisor function. This phase also enables recurrence to be controlled, by providing a means of contention of choice.

In terms of stability, ortho-surgical treatment enables an adult patient with a Class III malocclusion to benefit from a stable occlusion and superior esthetics [20] [21].

Several factors play a part in the durability of the results obtained by surgery, notably function. Facial equilibrium is largely dependent on functional factors, which, despite satisfactory anatomical correction, can lead to instability [22] [23].

Knowledge of orofacial functions, and of the rules that establish craniomaxillofacial equilibrium, is essential to the surgeon and the orthodontist, to ensure the durability of the procedures performed. [24].

6. Conclusion

Combined surgical and orthodontic treatment in adults with Class III malocclusions significantly improves occlusal stability and aesthetics. Pre-surgical orthodontic decompensation is crucial for optimal positioning of the jaws. Post-surgical orthodontics fine-tunes the result by correcting any dental misalignments.

Acknowledgements

None to declare.

Conflicts of Interest

The authors declare no conflicts of interest.

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