

## Retreatment of a Severe Skeletal Class III Following Iatrogenic Orthodontic Treatment

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### Abstract

**Description:** This paper outlines the case of an 18-year-old male who sought retreatment for a severe skeletal class III dentofacial deformity. In a previous treatment, an orthodontic camouflage that involved the extraction of two mandibular premolars was attempted.

**Methods:** To achieve optimal facial and occlusal results it was decided to retreat this patient with a combined orthodontic and orthognathic surgery treatment plan. In the pre-surgical phase, the lower premolar spaces were reopened to achieve proper dental decompensation. The orthognathic surgery involved a 20 mm sagittal maxillomandibular skeletal correction combined with an impaction of the maxilla and midline correction.

**Results:** After 28 months of treatment, skeletal and dental correction was achieved and facial features improved dramatically.

**Keywords:** Orthodontics; Orthognathic Surgery; Retreatment; Iatrogenics; Class III

### Introduction

When treating Class III dentofacial deformities in patients with little or no growth remaining, there are two possible treatment options: orthodontic camouflage or orthodontic treatment combined with surgical repositioning of the jaws [1]. For orthodontists, determining whether a case can be camouflaged or needs surgery might be an easy task, however, some patients present a challenging clinical situation commonly referred to as "borderline surgical", in which a moderate dentoskeletal discrepancy is accompanied by acceptable facial esthetics. In these cases, orthodontic camouflage may be a viable option [2-5].

On the contrary, in patients with severe Class III skeletal malocclusions, a combined surgical-orthodontic approach is the preferred option to improve facial esthetics and achieve a stable occlusion [6-8]. Camouflage orthodontics in these cases would require excessive compensatory tooth movements, which may lead to iatrogenic side effects such as root resorption, periodontal disease and poor stability [9]. Furthermore, it can also complicate the possibility of performing orthognathic surgery in the future, especially if extractions are carried out in the lower arch to compensate the negative overjet.

In this article we present the retreatment of a patient with a severe dental and skeletal Class III, who had previously completed an unsuccessful orthodontic camouflage treatment that involved the extraction of two mandibular premolars.

## Case Report

### Diagnosis and Treatment Plan

An 18 year old male patient presented with the chief complaint of unaesthetic facial appearance (Figure 1). During clinical evaluation, a strongly concave profile with accentuated mandibular prognathism and lip incompetence was observed. A severe class III molar relationship existed combined with a substantial anterior crossbite (overjet -11 mm) and an excessive retroclination of the lower incisors. The mandibular first premolars had been removed during his previous orthodontic treatment and the remaining space was significantly reduced. It was also found that the patient had a transverse asymmetry due to combination of a rotation of the maxilla (2 mm to the right) and the mandible (2 mm to the left). The cephalometric analysis indicated a skeletal Class III pattern due to mandibular prognathism (ANB = -11.5/SNA = 84.3/SNB = 95.8), an acute retroclination of the lower incisors (IMPA = 59) and a vertical pattern within the normal parameters (FMA = 24.8) (Table 1).

Measurement	Norm	Pre-Treatment	Pre-Surgical	Post-Treatment
SNA	82	84.3	84	87
SNB	80	95.8	96.1	85.4
ANB	2	-11.5	-12.1	1.6
FMA	26	24.8	23.6	28.5
IMPA	95	59	90.6	83.5
U1-Palatal Plane	110	114.3	116.6	112.2
Interincisal Angle	130	157.7	126.2	134.2
Lower Lip to E Plane	-2	-0.5	3	-2.1

Table 1: Cephalometric data.



Figure 1: Pre-treatment facial and intraoral photographs. In a failed attempt to compensate the class III malocclusion, lower first premolars were extracted in a previous orthodontic treatment.

With these findings it was concluded that the dental compensation attempted during the patient's previous 24-month orthodontic treatment had produced undesirable results and a new treatment with a different approach was necessary. Consequently, a combined orthodontic and orthognathic surgery treatment plan was proposed in order to improve facial esthetics and obtain an adequate masticatory function.

The pre-surgical orthodontic phase planned involved the alignment of the dentition within the arches, dental decompensation, leveling of the curve of Spee and coordination of the arches. In order to improve the position of the incisors within their bone bases, it was decided to reopen the mandibular first premolars spaces.

The surgical plan included a Le Fort 1 osteotomy for maxillary advancement and centralization combined with a bilateral sagittal split osteotomy for mandibular setback and centralization. An impaction of the maxilla was also planned to obtain adequate incisor exposure in the smile.

### Treatment progress

Upper and lower brackets and bands were installed (Roth prescription, 0.022 x 0.028 in. slot) and initial leveling and alignment was preformed using niti round archwires. Subsequently, rectangular stainless steel archwires were placed to coordinate the arches and the mandibular first premolar spaces were reopened with the use of niti coil springs. Decompensation of the lower arch occurred by leveling the curve of Spee and projecting the mandibular incisors. After 20 months of treatment the patient was ready for orthognathic surgery. At this point the resulting overjet was -17 mm (Figure 2).



**Figure 2:** Initial panoramic radiograph.

Pre-surgical records were taken 2 weeks prior to surgery and at the same appointment soldered hooks were placed on passive 0.019 x 0.025 stainless steel archwires that had been in place for more than 6 months (Figure 3). The final surgical planning included cephalometric/image predictions and model surgery to simulate bone movement and fabricate the surgical splints. The orthognathic surgery consisted of 8 mm of maxillary advancement with a 2 mm rotation to the left and a 2 mm impaction, combined with 12 mm of mandibular setback with a 2 mm rotation to the right. Due to the magnitude of the mandibular setback, the surgeon chose to use large reconstruction plates for better stability of the bone segments.



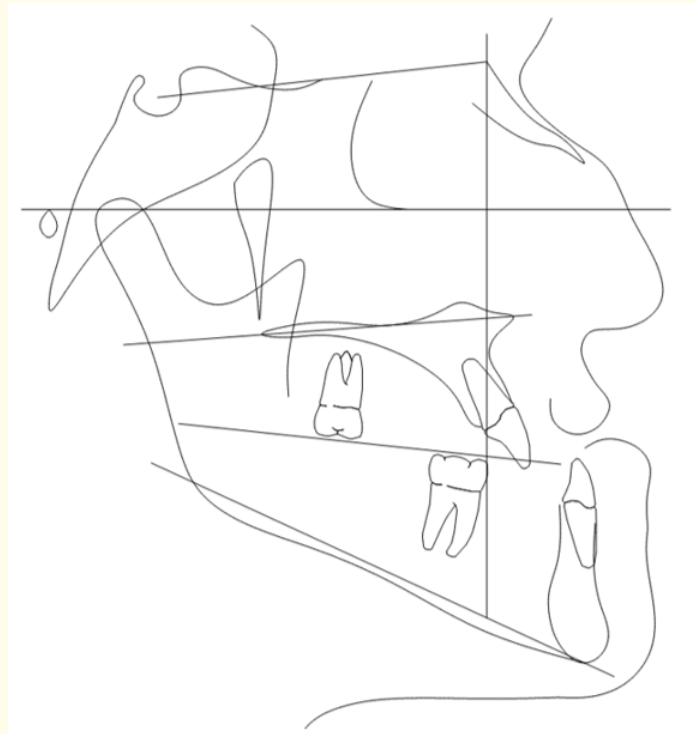
**Figure 3:** Initial lateral radiograph.

Post-surgical orthodontic treatment continued for 8 months with the objective of establishing a stable final intercuspitation. Total treatment time was 28 months. For the retention phase, a lower fixed retainer was bonded combined with an upper Hawley retainer. In order to maintain the space of the lower first premolars, temporary fixed retainers were placed and afterwards two fiber reinforced ceromer based adhesive bridges were installed as temporary space maintainers. Dental implants with porcelain crowns were planned as permanent restoration, but the patient decided to postpone this treatment.

### Treatment Results

A 20 mm sagittal maxillomandibular skeletal correction was achieved with orthodontic and orthognathic surgery treatment. Facial characteristics improved dramatically, resulting in a straight facial profile, adequate facial symmetry and a harmonious smile. The resulting facial appearance was balanced, esthetically pleasing and respected the individual characteristics of the patient.

The skeletal changes produced a substantial correction of the overjet, which went from -17 mm prior to the surgery to 2 mm at the end of treatment. The final occlusion was stable and a good intercuspitation was achieved with the presence of anterior and lateral guides. Also, coincident dental and facial midlines were attained (Figure 4).



**Figure 4:** Initial lateral cephalometric tracing.

A comparison between the pre-surgical and final cephalometrics shows that the ANB angle was normalized, increasing from -12.1 to 1.6. The 8 mm maxillary advancement resulted in a 3 degree increase of the SNA angle (from 84 to 87) and the 12 mm mandibular setback induced a 10.7 degree decrease of the SNB angle (from 96.1 to 85.4) (Figure 5).

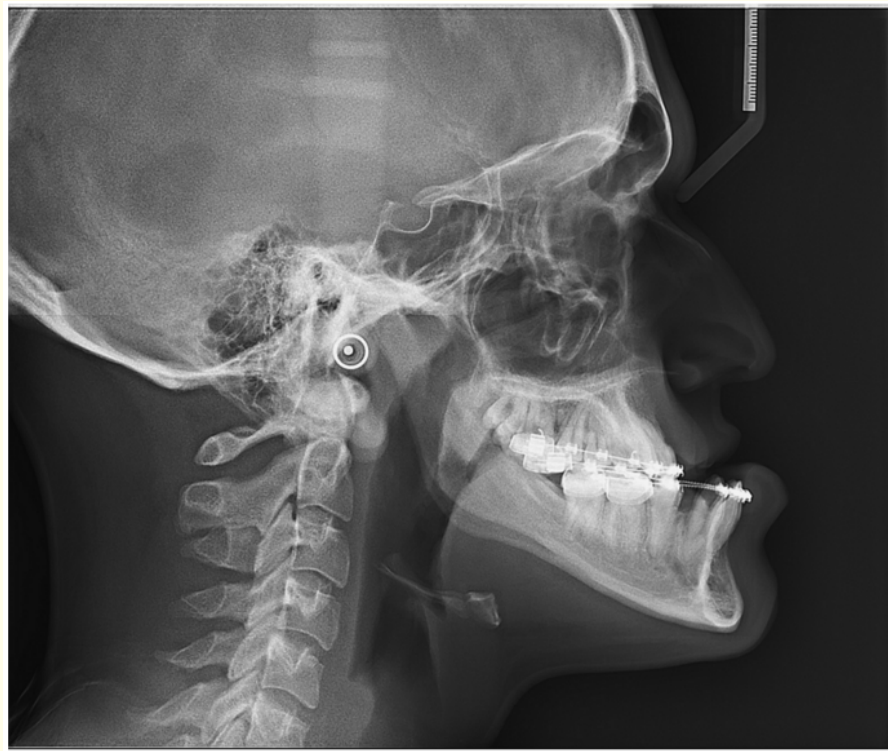


**Figure 5:** Dental decompensation involved the reopening of the mandibular first premolar spaces. The resulting overjet was -17 mm.

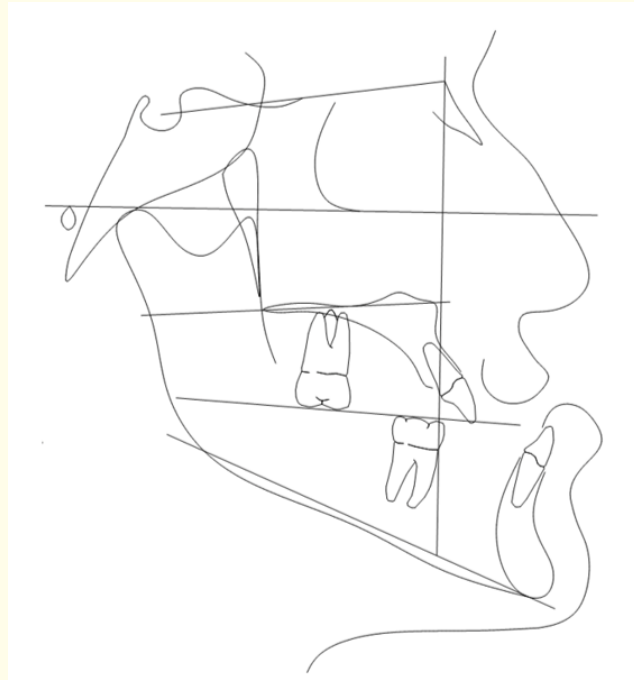
One year after debonding the results were stable and the patient was pleased with his facial and occlusal outcome (Figure 6-14).



**Figure 6:** Intermediate facial and intraoral photographs. After 20 months of pre-surgical orthodontic treatment dental decompensation was achieved.



**Figure 7:** Intermediate lateral radiograph.



**Figure 8:** Intermediate lateral cephalometric tracing.



**Figure 9:** Final facial and intraoral photographs after 28 months of surgical-orthodontic treatment. The total maxillomandibular sagittal correction was 20 mm.

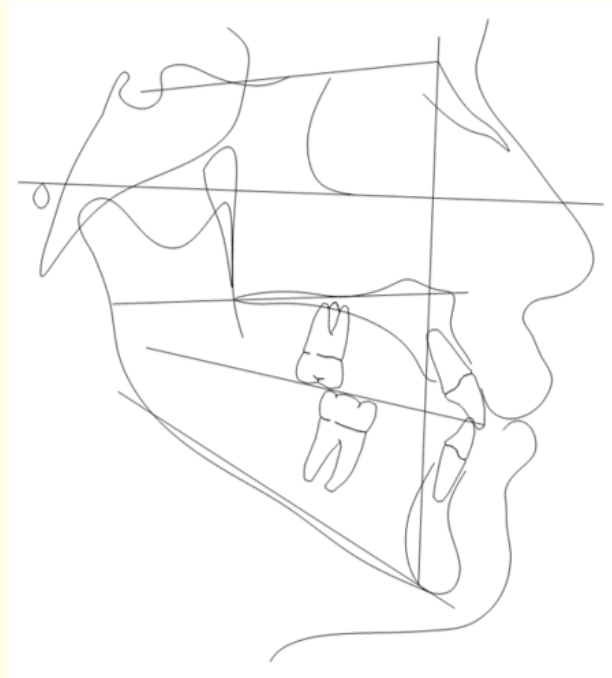


**Figure 10:** Final panoramic radiograph.

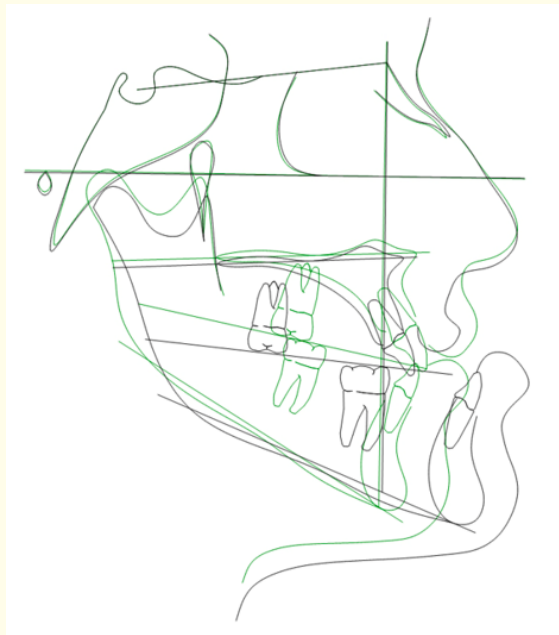


**Figure 11:** Final lateral radiograph.





**Figure 12:** Final lateral cephalometric tracing.



**Figure 13:** Superimposition of pre-surgical (black) and post-treatment (green) cephalometric tracings.



**Figure 14:** Superimposition of pre-surgical (black) and post-treatment (green) cephalometric tracings.

## Discussion

Without a proper diagnosis and realistic treatment objectives, nonsurgical alternatives for treatment of severe Class III skeletal malocclusions can produce detrimental side effects on teeth and surrounding structures [10]. In addition, the treatment may have a negative physiological impact on the patient due to undesirable results, time consumption and financial burden. For the orthodontist, it also may become a frustrating situation that could potentially have legal consequences due to patient dissatisfaction.

In the presented case, the mandibular first premolar extractions and subsequent dentoalveolar compensation attempted resulted in an extreme retroclination of the lower incisors. These teeth possibly could not have tolerated any further lingual movement; nevertheless, the patient still presented a negative overjet and poor facial esthetics. Orthodontics combined with orthognathic surgery was the only option that could have produced the amount of facial changes and occlusal improvement obtained in this case.

The duration of the unsuccessful orthodontic camouflage treatment was 24 months and if added to the 28-month orthodontic-surgery treatment, the total time with braces amounted to 52 months, an unacceptable length for any type of treatment. Looking at this case retrospectively, the camouflage treatment not only produced iatrogenic effects, it also made pre-surgical orthodontics much more complex and created the need for permanent restorations. A more careful treatment planning based on an accurate growth analysis may have provided enough information to delay the treatment until the patient had stopped growing and surgery could be preformed.

The study of treatment difficulties, such as those presented in this case report, provides a rare opportunity to gain perspective and aim towards an improvement in the quality of care we provide to our patients [11]. Inexperience or lack of training are commonly attributed as causes for iatrogenic complications, nevertheless orthodontists with vast experience and adequate training can also expose their patients to some degree of unintended irreversible damage. In these cases, limited time for diagnosis and treatment planning due to overcrowded offices may play a part in its occurrence [12].

### Conclusion

Orthodontic camouflage can produce satisfactory results in some “borderline surgical” patients. However, when treating severe dentoskeletal discrepancies this risky approach may lead to iatrogenic results. A thorough diagnosis and treatment plan that considers tooth movement limitations and remaining growth is essential before deciding to compensate the malocclusion relying only on orthodontic movement. The patient’s self-perception must also be considered since facial changes will be limited if surgery is not preformed. To achieve optimal results, orthodontics combined with orthognathic surgery is recommended in cases with severe Class III dentoskeletal deformities.

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