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Orthognathic Surgical Management of Skeletal Class III Malocclusion Laterognathia: A Case Report

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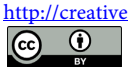


Abstract

Skeletal Class III malocclusions with mandibular asymmetry present significant diagnostic and therapeutic challenges due to their complex three-dimensional discrepancies. These conditions often result in both functional and aesthetic impairments, especially in adult patients where growth has ceased, limiting treatment options. Case Presentation: An 18-year-old female presented with mandibular prognathism and chin deviation, resulting in significant facial asymmetry and anterior crossbite. Clinical and radiographic examinations confirmed skeletal Class III malocclusion with mandibular laterognathia and hyperdivergence. A multidisciplinary team devised a comprehensive treatment plan involving orthodontics and orthognathic surgery. Treatment: Orthodontic preparation included standard Edgewise appliances and sequential archwires for leveling and alignment. The patient underwent maxillary advancement, asymmetric mandibular setback (5 mm left, 3 mm right), and genioplasty. Postsurgical care included intermaxillary elastics and continued orthodontic refinement. Results: Post-treatment assessments showed correction of facial asymmetry, improved dental occlusion, and harmonious facial balance. Cephalometric analysis confirmed skeletal improvement, and the patient reported enhanced aesthetic and psychosocial satisfaction. Conclusion: A multidisciplinary, patient-centered approach combining orthodontics and surgery is essential in treating skeletal Class III malocclusions with asymmetry. This strategy yields functional, aesthetic, and psychological benefits, emphasizing the importance of individualized planning and precise execution.

Subject Areas

Dentistry

Keywords

Skeletal Class III, Laterognathia, Orthognathic Surgery, Orthodontic-Surgical Treatment, Facial Asymmetry

1. Introduction

Skeletal Class III malocclusions are complex craniofacial deformities characterized by a forward positioning of the mandible relative to the maxilla. Intraorally, they typically present as an Angle Class III malocclusion associated with an anterior crossbite. These discrepancies frequently result in significant facial aesthetic concerns and can have a notable psychological impact on affected individuals. The underlying cause may involve mandibular prognathism, maxillary retrognathism, or a combination of both skeletal patterns [1] [2].

In many cases, mandibular asymmetry coexists with this skeletal deformity, further complicating both diagnosis and treatment planning. Clinically, it presents as a lateral deviation of the chin, a discrepancy between the maxillary and mandibular dental midlines, and a noticeable facial asymmetry affecting both hard and soft tissues [3] [4]. Such cases constitute a challenging clinical scenario for orthodontists.

While early orthopaedic intervention may positively influence maxillomandibular growth patterns, orthodontists frequently encounter adult patients who have either never undergone treatment or are experiencing relapse. In such post-pubertal cases, where craniofacial growth potential is fully exhausted, treatment options are limited [5] [6]. Two treatment approaches remain viable: orthodontic camouflage in moderate cases, and orthognathic surgery in more severe skeletal discrepancies [7] [8].

When the orthosurgical intervention is indicated, the selection of the surgical movements depends on the severity of the sagittal discrepancy.

Although bimaxillary surgery is gaining popularity, isolated mandibular setback or maxillary advancement can be effective treatment options in specific cases. Therapeutic decisions must be carefully planned, taking into consideration the patient's facial profile, soft tissue response, and the risk of long-term relapse [5].

This case report describes an 18-year-old female patient presenting with a skeletal Class III malocclusion combined with mandibular laterodeviation, successfully managed through an orthodontic–surgical approach.

2. Case Report

An 18-year-old female patient presented to the Dento-Facial Orthopedics Department in Casablanca primarily for aesthetic and functional concerns related to mandibular prognathism and a visibly asymmetric facial appearance, as well as inefficient incisal function, with particular emphasis on the aesthetic impairment

of her facial profile. The patient reported no family history of Class III malocclusion or relevant medical history.

Pre-treatment extraoral photographs: (a) frontal view at rest, (b) profile view at rest, (c) ¾ view at rest, (d) frontal view smiling, (e) profile view smiling, (f) ¾ view smiling;

Pre-treatment intraoral photographs: (g) anterior buccal view, (h) right buccal view, (i) left buccal view, (j) maxillary occlusal view, (k) mandibular occlusal view.

Pre-treatment radiographs: (a) panoramic radiograph, (b) lateral cephalometric radiograph.

Figure 1. Orthodontic assessment before treatment.

Extraoral clinical examination revealed a long, asymmetric face with a 2 mm deviation of the chin to the right, presence of a resting stomion, and pronounced nasolabial folds. The profile view demonstrated a marked concavity, increased cervicomental distance, and a slightly obtuse nasolabial angle. The smile was characterized by reduced exposure of the dentition.

Intraoral examination revealed a clearly negative overjet with anterior and posterior crossbites, and bilateral Angle Class III dental relationships. Both the maxillary and mandibular arches were well aligned, with no crowding observed (**Figure 1**).

Pre-treatment radiographic evaluation included cephalometric analysis, confirming a skeletal hyperdivergence (GoGn to SN angle of 38˚, FMA = 30˚) along with a Class III skeletal relationship according to Balard's classification (ANB = −5˚), associated with mandibular laterognathia. Additionally, maxillary incisors exhibited proclination (I to NA = 30˚), whereas mandibular incisors showed normal inclination (I to NB = 25˚) (**Figure 2**, **Table 1**).

Table 1. Pre-treatment cephalometric values.

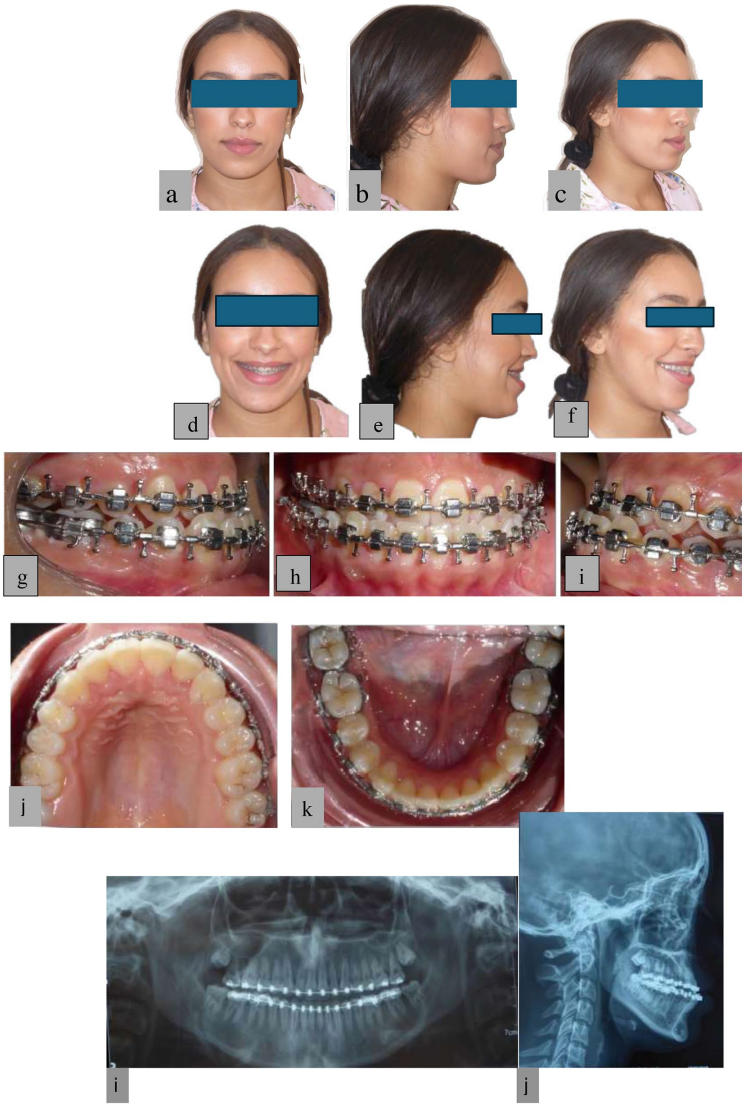
Cephalometry	Objectives	Pre-treatment
		80˚
SNA	82˚	
SNB	80˚	85˚
ANB	2˚	−5˚
SND	76˚	83˚
U1-NA	22˚	30˚
U1-NA (mm)	4 mm	6.5 mm
L1-NB	25˚	25˚
L1-NB (mm)	4 mm	5 mm
U1-L1	131˚	107˚
Pog-NB		2 mm
Occ-SN	14˚	
GoGn-SN	32˚	19˚

Treatment Plan and Course of Treatment

Following a detailed discussion with the patient and a multidisciplinary consultation with the maxillofacial surgeon, a comprehensive treatment plan was established based on clinical and radiological data analysis. A combined orthodontic–surgical approach was undertaken, involving an asymmetric mandibular setback osteotomy, maxillary advancement, and genioplasty.

Alignment, leveling, and arch form correction were performed using a standard Edgewise fixed appliance (0.022 × 0.028") with sequential nickel-titanium archwires of increasing dimensions: 0.014", 0.016", 0.018", 0.016 × 0.022", 0.017 × 0.025", and 0.019 × 0.025".

Extraoral photographs during treatment before surgery: (a) frontal view at rest, (b) profile view at rest, (c) ¾ view at rest, (d) frontal view smiling, (e) profile view smiling, (f) ¾ view smiling; **Intraoral photographs before surgery:** (g) anterior view, (h) right buccal view, (i) left buccal view, (j) maxillary occlusal view, (k) mandibular occlusal view.



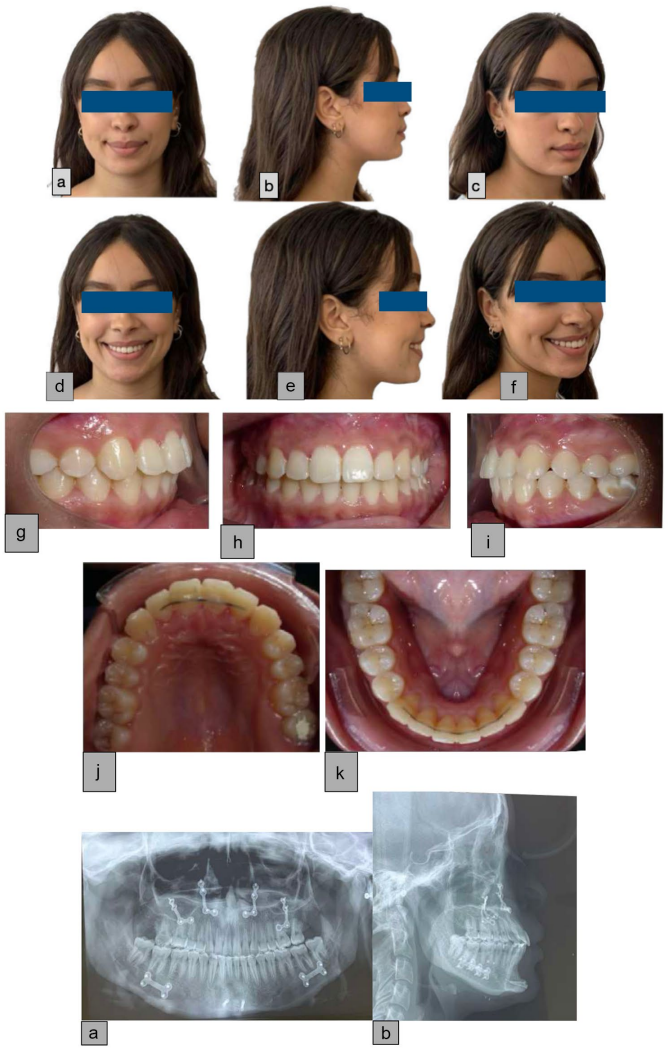
Pre-surgical radiographs: (i) panoramic radiograph, (j) lateral cephalometric radiograph.

Figure 2. Pre-surgical orthodontic assessment.

Stainless steel archwires (0.019 × 0.025") were placed five weeks prior to surgery to stabilize the dental arches. At this stage, before proceeding to surgery, a comprehensive photographic and radiographic evaluation, articulator mounting, and cephalometric analysis were performed (**Figure 2**).

Surgical splints were fabricated based on the simulated movements agreed upon in collaboration with the maxillofacial surgeon: asymmetric mandibular setback of 5 mm on the left and 3 mm on the right, maxillary advancement of 3 mm, and genioplasty for chin repositioning.

End of treatment extraoral photographs: (a) frontal view at rest, (b) profile view at rest, (c) ¾ view at rest, (d) frontal view smiling, (e) profile view smiling, (f) ¾ view smiling; **End of treatment intraoral photographs:** (g) anterior view, (h) right buccal view, (i) left buccal view, (j) maxillary occlusal view, (k) mandibular occlusal view.



End-of-treatment radiographs: (a) panoramic radiograph, (b) lateral cephalometric radiograph.

Figure 3. Postsurgical orthodontic.

Following surgery, mini-plates were used for osteosynthesis to maintain the final mandibular position. The genioplasty was performed at the end of the procedure to improve chin positioning and reduce skeletal and facial hyperdivergence. Intermaxillary elastics were worn by the patient for 21 days immediately postoperatively.

Postoperative care included a soft diet for the first 15 days after surgery, gradually progressing to foods of increasing consistency, requiring only light mastication.

Active orthodontic treatment resumed five weeks post-surgery, once satisfactory mandibular opening was achieved. The primary objective of this postoperative phase was to refine dental arch alignment and establish ideal occlusal rela-

tionships.

Cephalometric changes throughout treatment are summarized in the table below (Table 2).

The choice of a combined orthodontic–surgical approach with bimaxillary surgery and genioplasty was justified by the severity of the skeletal discrepancy. The patient presented with a marked negative overjet, a skeletal Class III relationship (ANB = −5˚), and hyperdivergence (FMA = 30˚), making orthodontic camouflage insufficient. Furthermore, the presence of facial asymmetry with mandibular laterodeviation excluded single-jaw surgery, which would not allow adequate three-dimensional correction.

The maxillary procedure consisted of a Le Fort I osteotomy with 3 mm advancement. The mandibular procedure was performed using bilateral sagittal split osteotomy (BSSO), allowing asymmetric setback of 5 mm on the left side and 3 mm on the right side. A genioplasty was additionally carried out to improve chin position and facial symmetry.

The presurgical orthodontic phase lasted approximately 10 months. The postsurgical orthodontic phase lasted 8 months, resulting in a total active treatment time of 18 months. The patient was followed for 36 months after treatment completion. Retention protocol included fixed bonded retainers from canine to canine in both arches, along with a removable night-time retainer.

At the end of treatment, a positive overjet of 2 mm and an overbite of 2 mm were achieved. The maxillary and mandibular dental midlines were aligned with the facial midline. Chin deviation was significantly reduced, with residual asymmetry of approximately 1.3 mm. Incisal function was restored, allowing effective anterior guidance (Figure 3).

No significant postoperative complications were reported. The patient exhibited neither temporomandibular joint symptoms nor persistent neurosensory disturbances.

Table 2. Comparison of cephalometric values before, during, and after treatment.

Céphalometry	Objectives	Pre-treatment	Pre-surgery	Post-surgery	End of treatment
SNA	82˚	80˚	82˚	86˚	86˚
SNB	80˚	85˚	88˚	83˚	83˚
ANB	2˚	−5˚	−6˚	3˚	3˚
SND	76˚	83˚	85˚	80˚	80˚
U1-NA	22˚	30˚	28˚	28˚	27˚
U1-NA (mm)	4 mm	6.5 mm	5 mm	5 mm	4.5 mm
L1-NB	25˚	25˚	25˚	27˚	25˚
L1-NB (mm)	4 mm	5 mm	5 mm	4.5 mm	4.5 mm
U1-L1	131˚	107˚	118˚	119˚	121˚
Pog-NB		2 mm	2 mm	3 mm	3 mm
Occ-SN	14˚	19˚	17˚	15˚	15˚
GoGn-SN	32˚	38˚	39˚	32˚	32˚

3. Discussion

This paper has limitations inherent to its design as a single case report. The findings are based primarily on end-of-treatment evaluations, and the absence of long-term follow-up and standardized outcome assessment tools limits the generalizability of the results.

Skeletal Class III malocclusions, especially those associated with mandibular asymmetry, constitute a multifaceted clinical challenge due to their functional, aesthetic, and psychosocial implications. These conditions are characterized by complex three-dimensional discrepancies, thereby rendering accurate diagnosis and effective treatment planning particularly intricate [3] [4].

The etiology is often multifactorial, involving a combination of genetic, functional, traumatic, and developmental factors [9]. Adult patients typically seek treatment at a stage where craniofacial growth has ended, thereby restricting therapeutic interventions primarily to a combined orthodontic-surgical approach [6] [7]. A thorough analysis is therefore essential to differentiate the skeletal component from dental compensation, as recommended by Kim *et al*. (2023) [4].

Treatment planning is primarily based on a comprehensive clinical examination combined with a rigorous cephalometric analysis. Precise identification of skeletal discrepancies, quantification of sagittal and transverse deviations, as well as assessment of soft tissue parameters, enable the formulation of a treatment plan tailored to the individual characteristics of each patient. Cephalometric superimpositions performed throughout the course of treatment allow visualization of skeletal changes and validation of clinical decisions. Although this classical approach is highly analytical, it remains invaluable when applied methodically and customized to the patient.

Zhang *et al*. (2024) proposed a comprehensive classification system for facial asymmetries, delineating four principal types through the analysis of 28 three-dimensional variables. This framework significantly enhances the precision of personalized surgical planning [3]. This enables clinicians to tailor interventions to the precise nature of the asymmetry.

Orthognathic treatment enables a harmonious three-dimensional correction of the skeletal bases and dentoalveolar arches, while preserving the functional envelope and reestablishing soft tissue and facial balance. The combination of maxillary advancement with asymmetric mandibular setback, supplemented by genioplasty, as illustrated in this case report, is a commonly employed therapeutic strategy to simultaneously address skeletal discrepancies across all three spatial planes [7] [8] [10].

A pivotal factor in the success of orthognathic treatment lies in the quality of the pre-surgical orthodontic preparation. This critical phase is intended to eliminate acquired dental compensations and restore the inclinations of the teeth to their optimal skeletal positions. Inadequate or incomplete decompensation can compromise the surgical plan and restrict the extent of feasible skeletal movements, such as mandibular setback or maxillary advancement. Chen *et al*. (2019)

highlighted the importance of proper dental and skeletal assessment in skeletal Class III asymmetry cases and emphasized that adequate orthodontic preparation contributes to accurate surgical correction and improved postoperative facial balance [9].

One of the primary objectives of this therapeutic approach is to ensure long-term stability of the outcomes achieved. This remains a central concern for both the orthodontist and the maxillofacial surgeon. While the aesthetic results are often immediate, striking, and perceived as highly satisfactory by both the patient and the clinical team, the risk of relapse, particularly in the transverse dimension, cannot be disregarded.

Several factors influence the long-term stability of surgical-orthodontic outcomes, including the postoperative positioning of the mandibular condyles, muscle tone, occlusal equilibration, and adherence to postoperative instructions. Previous studies have demonstrated that treatments performed after completion of skeletal growth provide greater postoperative stability and reduced relapse risk compared with interventions carried out before skeletal maturation [9].

Beyond clinical success, it is essential to highlight the psychosocial impact of orthognathic treatment on patients. Numerous studies have demonstrated the positive effects of combined orthodontic-surgical therapy on self-esteem, quality of life, and social interactions [5] [11] [12].

Eslamipour *et al*. showed, through their work, that orthognathic surgery leads to a significant improvement in patients' quality of life. This improvement was observed across the emotional, oral functional, psychological, and social domains of quality of life. The greatest impact was reported in the emotional domain, whereas the least impact concerned functional aspects. The authors also noted that their study assessed quality of life over a limited postoperative period, highlighting the need for longitudinal studies in this field within health services research [13].

Although the aesthetic and functional outcomes were satisfactory at the end of treatment, long-term stability was not assessed beyond the available follow-up period. Additionally, psychosocial outcomes were not evaluated using standardized measures, which represents a limitation in interpreting the overall benefits of the treatment.

4. Conclusions

A multidisciplinary approach is fundamental to the management of skeletal Class III malocclusions associated with mandibular asymmetry. These cases pose significant challenges in both diagnosis and treatment.

In adult patients, the combination of orthodontic therapy and orthognathic surgery remains the most effective approach to correct both skeletal deformity and facial asymmetry. Beyond aesthetic outcomes, such interventions have a profound impact on patients' self-esteem and overall quality of life. Therefore, it is essential to adopt a personalized, patient-centered approach to ensure durable

functional, aesthetic, and psychosocial results.

5. Etic

Written informed consent was obtained from the patient for both treatment and publication of clinical data. According to institutional policies, ethical approval was not required for this type of case report.

Conflicts of Interest

The authors declare no conflicts of interest.

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