Orthodontic Surgical Approach in the Management of Severe Skeletal Class III Malocclusion

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ABSTRACT

Treating skeletal Class III malocclusion is often challenging for clinicians because its causes are complex, involving both genetic and environmental influences. In growing patients, early orthopedic intervention can help guide proper jaw development. For adults, mild cases may be managed with orthodontic camouflage, but severe skeletal discrepancies typically require a combination of orthodontic treatment and orthognathic surgery. This case report presents a patient with severe skeletal Class III malocclusion who was successfully managed using a Le Fort I osteotomy with maxillary advancement and Bilateral Sagittal Split Osteotomy (BSSO) setback procedure.

KEY WORDS

Bimaxillary surgery, Class III malocclusion, Mandibular prognathism, Orthognathic surgery, Skeletal discrepancy

INTRODUCTION

Skeletal Class III malocclusion, characterised by maxillary retrusion or mandibular prognathism, presents significant functional and aesthetic challenges.[1] Its prevalence varies globally, ranging from about 1% in Caucasian populations to nearly 15% in Asians, with a reported incidence of approximately 6-7% in Nepalese populations.[2-4] In growing patients, early dentofacial orthopedic interventions such as facemask protraction, chin cup therapy, and rapid maxillary expansion can effectively redirect growth and reduce the need for surgery later.[5-7] However, once growth ceases, these methods lose efficacy, and treatment strategies shift toward orthodontic camouflage or orthognathic surgery, depending on the degree of skeletal involvement.[8,9] Orthodontic camouflage aims to mask the skeletal discrepancy through dental compensations, such as proclination of maxillary incisors and retroclination of mandibular incisors.[10] This approach is feasible in mild cases but has limitations in moderate to severe cases in terms of esthetics, occlusal function and long-term stability. In contrast, orthognathic surgery, often combined with presurgical orthodontic decompensation, provides definitive correction by repositioning the jaws within the facial skeleton, achieving both functional and esthetic rehabilitation.[11]

CASE REPORT

A 20-year-old male presented with a chief complaint of an unattractive facial appearance due to a forwardly placed lower jaw and irregular front teeth. Extraoral examination revealed a leptoprosopic facial form with concave profile, prominent chin, competent lips, and reduced maxillary incisor display. Intraoral examination showed a Class III molar relationship on the left and Class I molar relationship

on the right, an anterior crossbite of 4.5 mm, severe crowding in both arches, and a maxillary midline shift (3 mm to the right). The maxillary centrals and left lateral incisor were non-vital due to traumatic occlusion (Fig. 1).

Figure 1. **Pre-treatment extraoral and intraoral photographs**

Cephalometric analysis confirmed a skeletal Class III pattern (ANB = -7°) with mandibular prognathism (SNB = 91°) and dental compensations (proclined upper incisors: UI-NA = 28°/6 mm, UI-SN = 110°; retroclined lower incisors: LI-NB = 5°/0.5 mm, IMPA = 75°). Soft tissue evaluation revealed retrusive upper and normal lower lips (UL to E-line = −7 mm, LL to E-line = −2 mm) and an acute nasolabial angle (NLA = 81°). COGS analysis further confirmed sagittal maxillomandibular discrepancy with associated dental compensations (Fig. 2, Table 1). The patient was diagnosed with Angle's Class III subdivision (left) malocclusion on a skeletal Class III base and was planned for presurgical orthodontics followed by orthognathic surgery to achieve best possible functional and aesthetic outcomes.

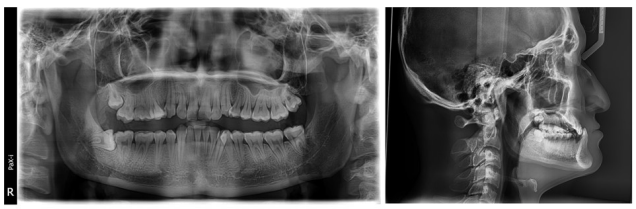

Figure 2. **Pre-treatment radiographs**

Figure 3. **Pre-surgical extraoral and intraoral photographs**

Table 1. **Comparative cephalometric parameters.**

Cephalometric parameters	Clinical norms	Pre-treatment values	Pre-surgical values	Post-treatment values
Skeletal parameters				
SNA	82±2°	84°	85°	88°
SNB	80±2°	91°	91°	86°
ANB	2±2°	-7°	-6°	2°
Wits	-1 mm	-8.5 mm	-7.5 mm	-2 mm
FMA	25±5°	13°	14°	17°
SN-GoGn	32±2°	14°	16°	23°
Dental parameters				
UI-NA	22±2°/ 4 mm	28°/6 mm	29°/6 mm	36°/5 mm
UI-SN	104°±2°	110°	115°	122°
LI-NB	25±2°/4 mm	5°/0.5 mm	22°/4 mm	25°/ 4 mm
LI – A Pog	2.7±1.7 mm	-3.5 mm	-6 mm	2 mm
IMPA	90±5°	75°	91°	95°
Interincisal angle	134°	156°	134°	120°
Soft tissue parameters				
Nasolabial angle	102±8°	81°	81°	91°
E-line (Upper lip)	-4 mm	-7 mm	-6 mm	-4 mm
E-line (Lower lip)	-2 mm	-2 mm	-0.5 mm	-3 mm

Treatment objectives were to correct the skeletal discrepancy and achieve a stable Class I occlusion. Presurgical orthodontics involved extraction of the upper right second premolar and fixed appliances (0.022" slot MBT prescription) to align teeth and remove dental compensations, intentionally worsening the reverse overjet (Fig. 3). Virtual surgical planning (Pro Plan software) guided a Le Fort I osteotomy for maxillary advancement with correction of the maxillary midline by shifting it 1 mm to the left and a rotational adjustment of 5 degrees. This was followed by bilateral sagittal split osteotomy(BSSO) for a 5 mm mandibular setback (Fig. 5). Surgery was performed using digitally fabricated splints (Fig. 6). Postsurgical orthodontics involved elastics for final detailing. Retention was provided with a Hawley's retainer and a fixed lingual retainer.

Figure 4. **Pre-surgical lateral cephalogram**

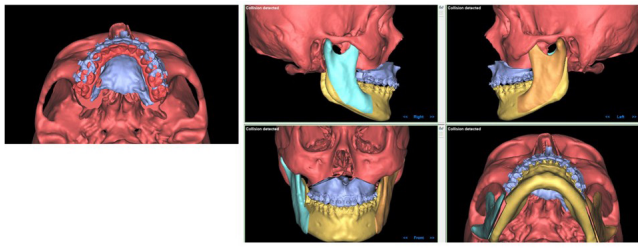

Figure 5. **Predicted outcomes after Virtual Surgical Planning on Pro Plan software**

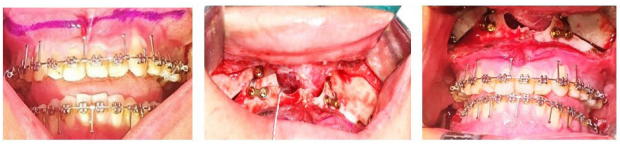

Figure 6. **Intraoperative photographs**

Post-treatment evaluation revealed a significant improvement in facial profile from concave to convex. A skeletal Class I relationship (ANB = 2°) was achieved. Proper interdigitation with corrected overjet and overbite and bilateral Class I canine relationship were established. The anterior crossbite and midline discrepancy were resolved. Cephalometric superimposition confirmed favourable skeletal changes and stable incisor positioning (Fig. 7,8,9).

Figure 7. **End-treatment extraoral and intraoral photographs**

Figure 8. **End-treatment radiographs**

DISCUSSION

Management in this case followed the conventional three-phase treatment protocol consisting of presurgical orthodontics, orthognathic surgery, and postsurgical orthodontics. The incorporation of virtual surgical planning further enhanced treatment accuracy and surgical predictability, enabling coordination of the maxilla and mandible and correction of the midline discrepancy. The combined use of Le Fort I osteotomy for maxillary advancement and bilateral sagittal split osteotomy (BSSO) for mandibular setback is well documented as an effective approach for managing severe skeletal Class III malocclusions, providing favorable occlusal relationships and improved facial balance.[12,13] Evidence from the literature consistently supports the superiority of bimaxillary procedures over single-jaw surgery with respect to both postoperative stability and esthetic outcomes. A systematic review reported that skeletal Class III corrections demonstrate good stability when maxillary advancement is limited to 5 mm or less and the presurgical sagittal discrepancy is below 7 mm.[12] Additionally, long-term follow-up data have shown minimal relapse following maxillary advancement (approximately 0.1 mm), whereas mandibular setback procedures exhibited an average relapse of 1.7 mm, with greater setbacks posing a higher risk.[13] These findings support the treatment choice in our case, where a balanced combination of maxillary advancement and mandibular setback minimized the need for excessive single-jaw movement. While our patient showed excellent skeletal and aesthetic outcomes, a limitation of this report is the short follow-up period, necessitating long-term monitoring for potential relapse, particularly in mandibular setback cases.[13]

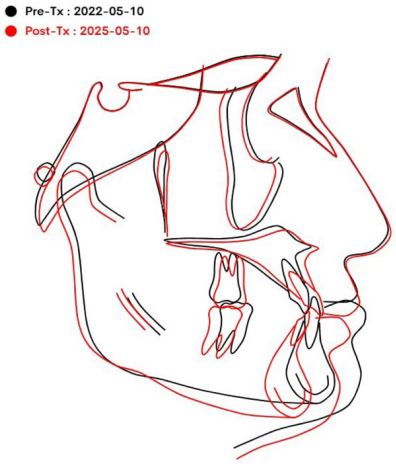

Figure 9. **ABO Superimposition**

The coordinated orthodontic surgical management of this severe skeletal Class III malocclusion resulted in successful functional and aesthetic rehabilitation, demonstrating the effectiveness of a multidisciplinary team approach for such complex dentofacial deformities.

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