Case Report

Surgical management of Class III malocclusion: A 1 year follow-up

ABSTRACT

For patients whose orthodontic problems are so severe that neither growth modification nor camouflage offers a solution, surgery to realign the jaws or reposition dentoalveolar segments is the only possible treatment option left. One indication for surgery is a malocclusion too severe for orthodontics alone. It is possible now to be at least semiquantitative about the limits of orthodontic treatment in the context of producing normal occlusion as the diagrams of the "envelope of discrepancy" indicate. In this case report, we have presented orthognathic treatment plan of an adult male patient with skeletal Class III malocclusion and anterior crossbite. Patient's malocclusion was decompensated by orthodontic treatment just before the surgery and then normal jaw relationship achieved by bilateral sagittal split ramus osteotomy. Patient's dental and facial profile was improved in a total of 18 months treatment duration. One-year follow-up showed stable results.

Keywords: Bilateral sagittal split ramus osteotomy, envelope of discrepancy, orthognathic surgery, skeletal Class III

INTRODUCTION

Class III malocclusion is considered to be one of the most difficult and complex orthodontic problems to treat. Prevalence of Class III malocclusion in Caucasians ranges from 0.8% to 4.0% and increases to 12%–13% in Chinese and Japanese populations, whereas in North Indian population, Class III malocclusion is found in up to 3.4% of the population.[1,2]

To reach normal occlusion and facial esthetics for Class III adult patients, a treatment plan includes either further dentoalveolar compensation or orthognathic surgery following decompensation of the teeth and to come up with treatment alternatives for such patients, an interdisciplinary approach is required.[3]

The objective of this article is to present the orthognathic treatment of skeletal and dental Class III malocclusion in an adult patient with anterior crossbite and prognathic mandible treatment by bilateral sagittal split ramus osteotomy for mandibular setback.

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CASE REPORT

A 19-year-old male patient came to the Department of Orthodontics and Dentofacial Orthopedics with the chief complaint of unesthetic facial appearance due to the large lower jaw. The patient had a leptoprosopic facial pattern, concave profile, long face, increased lower facial height with prognathic mandible, and average growth pattern. Intraorally, the patient showed anterior crossbite, with negative overjet of 3 mm and overbite of 3 mm, midline deviation and Angle's Class III molar relation [Figures 1-3].

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A pretreatment cephalometric for orthognathic surgery and composite analysis of the patient showed a skeletal Class III malocclusion with normal maxilla and prognathic mandible and average growth pattern [Table 1 and Figure 4].

The primary treatment objectives were to correct the Class III molar and canine relationship, achieve normal overjet and overbite, and especially to improve facial esthetics. The complementary treatment objectives were to establish good functional and stable occlusion and to improve the smile characteristics and dental esthetics.

A combination of orthodontic surgical treatment plan was selected for the patient involving bilateral sagittal split ramus osteotomy of mandible for mandibular setback.

The alternative treatment plan was orthodontic camouflage by extracting the first premolars in the lower arch.

The surgical prediction tracing was done using the NemoCeph software (Software Nemotec S.L. 1.998-2012, Spain; www.nemotec.com) and predicted posttreatment results were explained to the patient [Figure 5]. The patient decided to go with the surgical treatment plan.

The first phase of presurgical orthodontic treatment was started using MBT 0.022" slot preadjusted edgewise appliance. Leveling and alignment were started using 0.016" nickel titanium archwires. Later, the arches were coordinated and stabilized using 0.019 × 0.025" stainless steel wire [Figures 6 and 7]. The third molars were extracted 6 months before the surgery. In the immediate presurgical phase, surgical cephalometric prediction tracing was done and based on the values obtained from the NemoCeph software; mock surgery was performed with 10 mm mandibular setback using facebow transfer record [Figure 8]. Surgical splint was constructed [Figure 9].

The orthognathic surgical phase was carried out as planned with 10 mm mandibular setback by bilateral sagittal split ramus osteotomy. Intermaxillary fixation was done and surgical splint was placed [Figure 10]. The postsurgical orthodontic phase was started 8 weeks after the surgery. The arches were again aligned and leveled using smaller-to-larger cross-section wires, dental midline was coordinated using midline elastics, and occlusion was settled using settling elastics. This phase lasted for 5–6 months. The total treatment time was 18 months.

After removal of the appliance, the final records of cephalometric analysis for orthognathic surgery showed that the position of the maxilla was maintained and the

Figure 1: Pretreatment extraoral photographs

Figure 3: Pretreatment study model casts

Figure 2: Pretreatment intraoral photographs

Figure 4: Pretreatment lateral cephalogram

Table 1: Cephalometric analysis for orthognathic surgery and composite analysis of pretreatment, presurgical (after decompensation), and posttreatment records

Measurements	Norms (for males)	Pretreatment	Presurgical (after decompensation)	Posttreatment
Cranial base				
Ar to Ptm (mm)	37.1±2.8	28.2	28.2	28.2
Ptm to N (mm)	52.1±4.1	46.1	46.1	46.1
Skeletal horizontal				
N-A-Pg angle (°)	3.9±6.4	−19.9	−12.6	−7.8
N to A (mm)	0±3.7	−10.1	−10.1	−10.1
N to B (mm)	−5.3±6.7	−4.5	−4.5	0
N to Pog (mm)	−4.3±8.5	−1.8	−1.8	−1.6
Skeletal and dental vertical				
N to ANS through TVL (mm)	54.7±3.2	45.6	45.6	45.6
ANS to Gn through TVL (mm)	68.6±3.8	66.1	66.2	67.4
N to PNS through TVL (mm)	53.9±1.7	41.4	41.4	41.4
Pm-HP angle (°)	23±5.9	37.2	37.0	36.2
U1 to palatal plane (mm)	30.5±2.1	26.8	26.8	26.8
A6 to palatal plane (mm)	26.2±2	23.9	23.9	24.7
L1 to mandibular plane (mm)	45±2.1	39.8	39.8	42.2
B6 to mandibular plane (mm)	35.8±2.6	20.5	20.5	24.4
Maxilla - mandible				
Ramus height (Ar-Go) (mm)	52±4.2	49.9	49.9	45
Corpus length (Go-Pog) (mm)	83.7±4.6	88.8	88.8	79
Symphysis dimension (B-Pog) (mm)	8.9±1.7	9.0	9.0	8.0
Gonial angle (Ar-Go-Gn) (°)	119.1±6.5	135.6	135.0	131.2
Composite analysis				
SNA (°)	82±2	81	81	82
SNB (°)	80±2	89	89	82
ANB (°)	2±4	−8	−8	0
Mandibular plane angle (°)	32	30	30	31
FMA (°)	25±3	26	26	27
Interincisal angle (°)	131	135	127	125
U1 to NA (liner) (mm)	4	11	10	10
U1 to NA (angle) (°)	22	36	37	37
L1 to NB (linear) (mm)	4	4	4.5	4.5
L1 to NB (angle) (°)	25	18	20	20
Nasolabial angle (°)	102±8	87	98	98

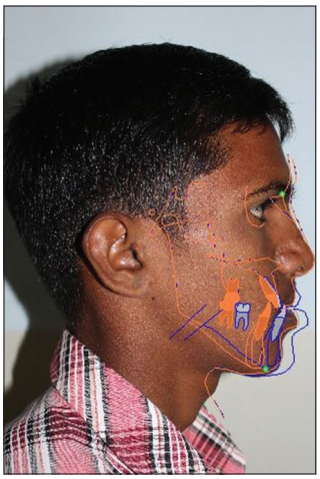

Figure 5: Surgical prediction tracing using NemoCeph software

Figure 6: Arches coordinated with 0.019 × 0.025" stainless steel archwire

anteroposterior position of the mandible was reduced (SNA = 82°, SNB = 82°) [Tables 1 and 2].

A great improvement in overall facial and dental appearances showing Angle's Class I molar and canine relationship with

appropriate overjet and overbite along with balanced facial soft tissues was achieved [Figures 11-13]. The superimposition cephalometric tracings showed mandibular counterclockwise rotation and backward movement [Figure 14].

A 1-year follow-up was done and the results were stable [Figures 15 and 16].

Figure 7: Presurgical lateral cephalogram

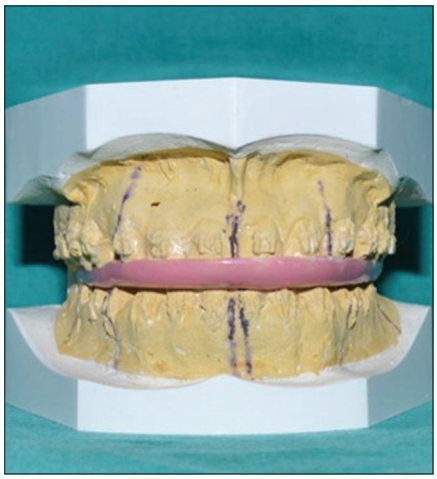

Figure 9: Splint fabrication

Figure 11: Posttreatment extraoral photographs

DISCUSSION

Skeletal Class III malocclusion is a classic example of "easy to be recognized but difficult to treat," the

Table 2: Result analysis

Feature	Pretreatment	Posttreatment
Incisor relation	Reverse overjet	Positive overjet
Overjet (mm)	−3	+2
Overbite (mm)	+3	+2
Lower incisor	Retroclined	Upright
Midlines	Shifted	Coincident
Molar relationship	Class III	Class I
Skeletal relationship	Class III	Class I
Index of treatment needs	4	1
Peer assessment rating index	33	0 (100% improvement)

Figure 8: Mock surgery for mandibular setback by 10 mm

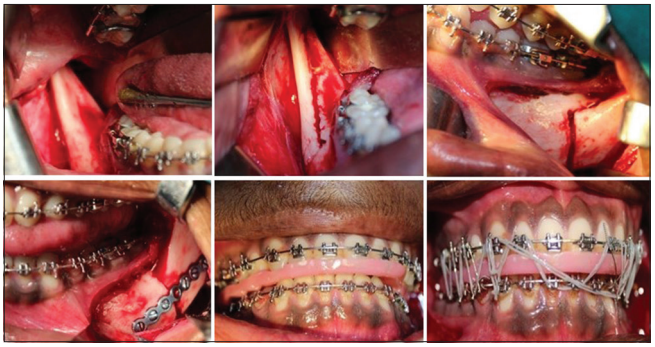

Figure 10: Bilateral sagittal split ramus osteotomy for mandibular setback followed by stabilization and intermaxillary fixation

Figure 12: Posttreatment intraoral photographs

situation where sometimes orthodontic possibilities are limited and need support from other specialties, particularly surgery.[4,5] However, the key to a successful treatment lies in understanding and integrating these two specialties in seeking the best alternatives and procedures, as it was in our case, where the treatment was carried out through orthodontic preparation and orthognathic surgery.

The current surgical methods for correcting skeletal Class III problems are ramus osteotomy to set back a prognathic mandible, mandibular inferior border osteotomy to reduce chin height and/or prominence, and/or LeFort I osteotomy to advance a deficient maxilla, often with segmentation to allow transverse expansion.[6,7]

In the presented case, surgical-orthodontic treatment was the best option for achieving an acceptable occlusion and a good esthetic result as diagnosed with the help of the clinical, cephalometric, and NemoCeph software prediction tracings. The maxilla was normally placed and did not require surgical repositioning, and therefore, single-jaw surgery for mandibular setback was chosen after interdisciplinary discussion with the oral surgeons.

Figure 13: Posttreatment lateral cephalogram

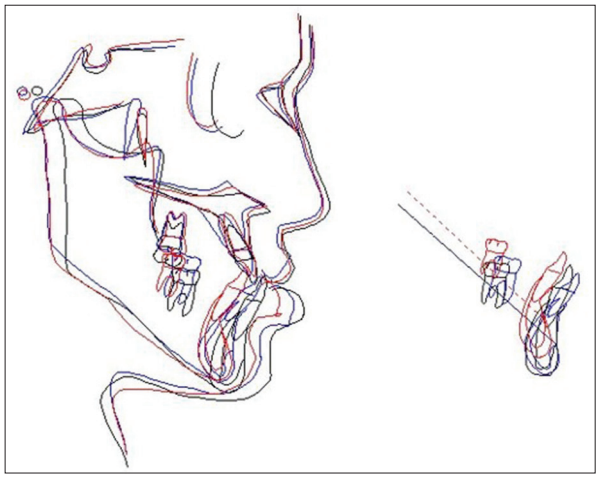

Figure 14: Superimposition tracings

Figure 15: One-year postsurgery intraoral and extraoral photographs

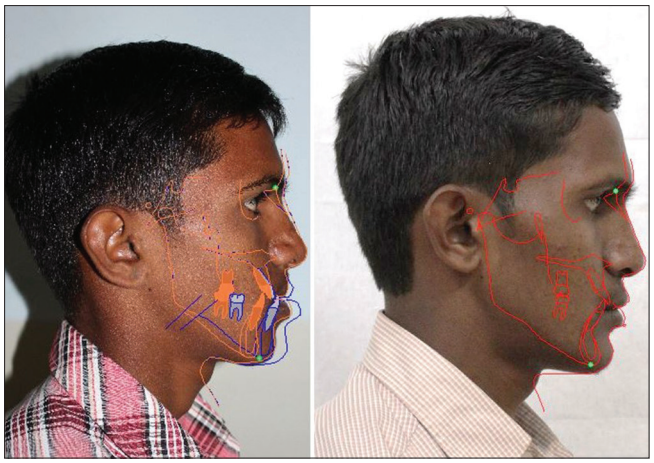

Figure 16: Comparison of surgical prediction tracing and posttreatment results

Furthermore, according to the envelope of discrepancy, malocclusion requiring a lower incisor movement of up to 3 mm can be corrected by orthodontics alone; orthodontic tooth movement combined with growth modification can help in backward movement of lower incisor by 5 mm. However, in our case, up to 10 mm backward movement of lower incisor was advised, and therefore, orthodontic–orthognathic surgery was the best option.

Before the setback surgery, preoperative orthodontic treatment, including decompensation of the malocclusion, was necessary. Usually, extractions are done for decompensation in presurgical orthodontic phase, which was avoided in this case as it was predicted with NemoCeph that nonextraction will give satisfactory results and can avoid side effects such as reduction in tongue space and posterior pharyngeal airway volume, double chin. Thus, the treatment plan was chosen with the help of prediction software.

The dental decompensation we performed was intended to retract the proclined maxillary incisors and to procline the retroclined mandibular incisors to a normal axial inclination. This patient's teeth were decompensated by closing the residual space in the maxillary arch and leveling the mandibular arch. After decompensation, the reverse overjet was increased from −3 mm to −6 mm. This was achieved after 10 months.

The studies reported a change in the position of the hyoid bone and reduction in the dimensions of the retrolingual and hypopharyngeal airway after mandibular setback surgery. Tselnik and Pogrel[8] reported a reduction of the retrolingual airway by 28% in distance and 12.8% in volume. In the presented case, the total reduction in posterior pharyngeal airway was only 18% (after elimination of horizontal magnification error).

The patient had a normodivergent facial pattern and setback of 10 mm was done. Eggensperger *et al*.[9] in their study for determining skeletal relapse after mandibular single-jaw surgery found that the chances of relapse were 30% less for hypodivergent facial pattern patients as compared with hyperdivergent facial pattern.

Kobayashi *et al*. found a significant relationship between setback and relapse, particularly when the amount of setback exceeds 10 mm.[10] The mandibular setback done in the presented case was 10 mm. There was not any complication in our case, and the postoperative healing period was uneventful. However, our patient underwent a 10 mm mandibular setback and did not show any relapse during 1-year after surgery.

CONCLUSION

Combined orthodontic and surgical management of a skeletal Class III malocclusion in an adult patient is a stable accepted treatment modality that allows the achievement of both profile correction as well as acceptable occlusion. The decision of one jaw versus two jaw surgery should depend on the patient's chief complaint, objective evaluation of the patient's profile, the extent of skeletal discrepancy, and stability factors. These procedures have become the ultimate choice of the patients suffering from dentofacial deformity and lack of self-confidence as these procedures are done on day-to-day basis with minor discomfort and postsurgical hospitalization.

The patient in the present case report was very pleased with the final result, which considerably improved his self-esteem.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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