International Journal Dental and Medical Sciences Research
Volume 7, Issue 6, Nov.-Dec. 2025 pp: 281-288 www.ijdmsrjournal.com ISSN: 2582-6018

Management of a Severe Class II Malocclusion with Surgery First Approach: A Case Report

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Date of Submission: 15-12-2025 Date of Acceptance: 30-12-2025

ABSTRACT
Adult patients with severe class II malocclusion due to mandibular deficiency are conventionally managed by combined surgical orthodontic treatment approach. This case report illustrates a surgery first treatment approach for the management of a 21 y old male presenting with skeletal Class II malocclusion with a hypodivergent craniofacial growth pattern leading to a deep impinging bite and an overjet of 11mm. An early surgical phase enhanced the facial appearance and addressed the chief complaints of the patient. This was followed by an orthodontic phase to achieve a harmonious occlusion with optimum overjet, overbite, Class I molar, canine and incisor relationship**.**

Keywords: Surgery first, Skeletal Class II malocclusion, Bilateral Sagittal split osteotomy, Genioplasty, Mandibular advancement

I. INTRODUCTION

Conventionally presurgical orthodontic treatment was considered as a prerequisite for orthognathic surgery to overcome post operative occlusal instability. However, in 2009 Nagasaka presented surgery first approach (SFA) for the management of skeletal class III malocclusion by combining skeletal anchorage system.[1] By this approach, patient's swallowing, speech, facial esthetics and occlusal function may improve early in the treatment.[2] Additionally, the benefit of SFA includes efficient and rapid orthodontic treatment by incorporating Rapid Acceleratory Phenomenon (RAP) initially introduced by Wilco et at in 2001,[3]moreover the direction of dental decompensation post surgery is in the same direction as that of dental adaptation to the surrounding new skeletal structures. Thus, shortening the total treatment time and achieving patient satisfaction at an early stage. [4,5]

SFA provides patient oriented approach addressing early improvement of facial esthetics, possibility of a shortened total treatment time. Moreover, it does not require an aggravated gross appearance during the presurgical orthodontic period. [6]

Combined orthodontic & orthognathic surgical treatment has been reported as a successful treatment for the correction of skeletal class II malocclusions. Bilateral sagittal split ramus osteotomy (BSSRO) is a popular method for treating skeletal class II malocclusion due to retrognathic mandible. However, patients with a prominent chin profile are benefited with an additional genioplasty.[7,8]

This case report illustrates a patient diagnosed with severe skeletal class II malocclusion managed by a combination of BSSRO & genioplasty with surgery first approach. Post operative orthodontics included transverse discrepancy correction with finishing and detailing.

DIAGNOSIS & ETIOLOGY

A 21 y old male reported with a chief complaint of difficulty in chewing, impinging deep bite and to improve his facial appearance. He had non contributory medical history. Facial analysis revealed convex profile with normal prominence of nose, increased nasolabial angle, deep mentolabial sulcus, lower lip backwardly placed irt E, H & S line, reduced lower anterior facial height.

Intraoral examination revealed Class II molar and canine relationship bilaterally with OJ = 11mm and OB of 90% with proclined upper and lower incisors, rotations in 14,24, spacing of 3mm in maxillary arch and maxillary dental midline deviated to right by 2mm.[Fig 1]

A lateral cephalometric analysis confirmed skeletal class II discrepancy with a SNA angle of 82°, SNB angle of 77°, ANB angle of 5°, Wits appraisal of 5mm, CS stage 6. The mandibular plane angle (FMA) was 14° and SN-GoGn was 18°. The lower anterior facial height to anterior facial height ratio (LAFH:AFH) was 54%. Pog-Na vertical was -5mm, Nasolabial angle was 120°and relation of lips to E line was -1/-5mm.Relation of upper incisors to NA (UI-NA) was 40°(8mm) and lower incisors to NB (LI-NB) was 30° (4mm). [Fig 2 & Table 1]

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PROBLEM LIST

Pathology: Extrinsic stains
Soft tissue: Convex profile
Increased nasolabial angle
Deep mentolabial sulcus
Flat smile arch
Intraarch: Rotation irt 14,24
Spacing of 3mm in maxillary arch
Transverse: Maxillary dental midline deviated to right by 2mm
Sagittal: Skeletal-Class II due to retrognathic mandible
Dental- Class II molar and canine bilaterally
Proclined upper & lower incisors
Increased Overjet 10 mm
Vertical: Skeletal- Reduced LAFH
Skeletal deep bite
Dental- Increased overbite 90%

TREATMENT OBJECTIVES

Based on the comprehensive problem list the treatment objectives formulated were as follows :-
Pathology: Oral prophylaxis
Soft tissue: Improvement of profile
Enhancement of smile esthetics
Intraarch: Alignment
Transverse: Correction of maxillary midline
Sagittal: Correction of skeletal bases
To achieve Class I molar and canine relation bilaterally
Inclination correction
Optimization of overjet
Vertical: Correction of skeletal bases
Optimization of overbite

TREATMENT ALTERNATIVES

The following treatment alternatives were discussed with the patient before obtaining informed consent. (1) No treatment would have worsened the patient's difficulty in chewing and would have not improved patient's profile. (2) Orthodontic compensation (camouflage) would have addressed to dental class II however, it would have not improved the patient's profile and would not open mandibular plane significantly to correct the skeletal deep bite. Extraction protocol would have further deteriorated the skeletal deep bite. (3) Mandibular advancement devices would have achieved a dental class II however our case was a skeletally mature individual in CS stage 6 which would have further increased lower inclination without improving profile of the patient.

(4) Conventional orthodontic orthognathic surgical approach would take long to address the chief complaints of the patient. (5) Surgery First Orthognathic Approach (SFOA) or SFA is an orthognathic approach that consists of orthognathic surgery followed by post surgical orthodontic treatment without any presurgical orthodontic treatment.[8]

Both orthognathic surgery approaches would address the complaints however surgery first approach would timely address to all the patient's chief complaints thus enhancing the satisfaction of the patient. This approach would open the mandibular plane significantly to correct the deep bite and to correct the Skeletal class II due to retrognathic mandible. Moreover, the conventional orthognathic approach would first correct the dental alignment, midline discrepancies and inclination correction before addressing the mandibular surgery.

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Fig 1: Pre treatment facial and intraoral photographs

II. TREATMENT PROGRESS

Presurgical orthodontics

Preadjusted 0.022-inch edgewise MBT brackets were bonded in maxillary and mandibular arch however no alignment of the arches was carried out pre surgery. Brackets were ligated with a 0.010-inch steel ligature wire. A passive 0.018- inch stainless steel wire with crimpable hooks were placed. Presurgical models were mounted on a semi adjustable articulator and a surgical splint was fabricated with 6 mm mandibular advancement.

Surgical procedure

BSSRO was performed with a 6mm mandibular advancement. Standard bilateral sagittal split osteotomies were carried out using established protocol. The customized surgical splint was then used to guide and stabilize the mandible into its required position. The neurovascular bundle was carefully preserved, distal and the proximal segments were fixed using two 4-hole titanium miniplates bilaterally. After mandibular advancement reduction sliding genioplasty was performed by 3mm. Rigid fixation of chin segment was achieved using two 3-hole titanium miniplates ensuring adequate stability and contour. Surgical healing was uneventful with a stable outcome.

Post surgical orthodontic phase

Intermaxillary fixation by elastics was carried out for four weeks post surgically along with interarch Class II elastics to guide mandible into its advanced position.[Fig 6] After removal of the surgical splint tripod occlusion was observed. Arches were initially aligned with Nickel Titanium wires and sequentially changed to 0.018" Stainless steel (SS) wire for levelling of curve of spee with vertical intermaxillary elastics. Maxillary dental midline was corrected on a rigid 0.019 x0.025" SS arch wire followed by space closure in maxillary anteriors with loop placement.[Fig 7] Maxillary incisors were retracted making overjet to 2mm from a overjet of 5 mm post surgery. After finishing and detailing phase, fixed appliance were debonded and a wraparound retainer was placed in the maxillary arch and a bonded retainer in the mandibular arch.

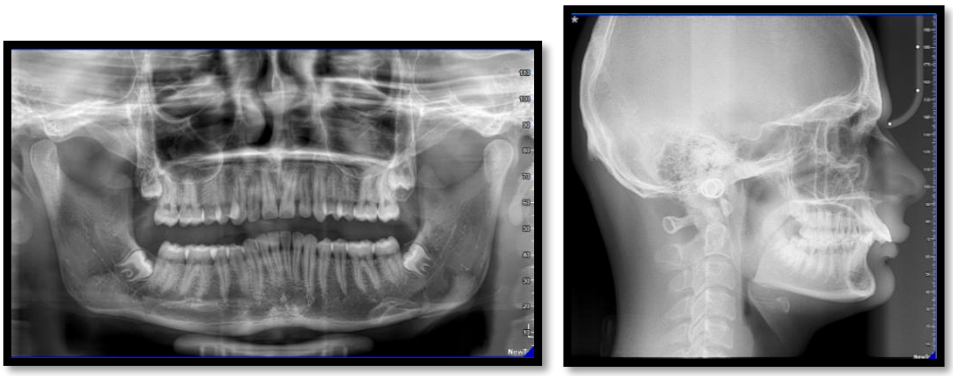

Fig 2: Pretreatment radiographs: Panoramic radiograph & lateral cephalograph

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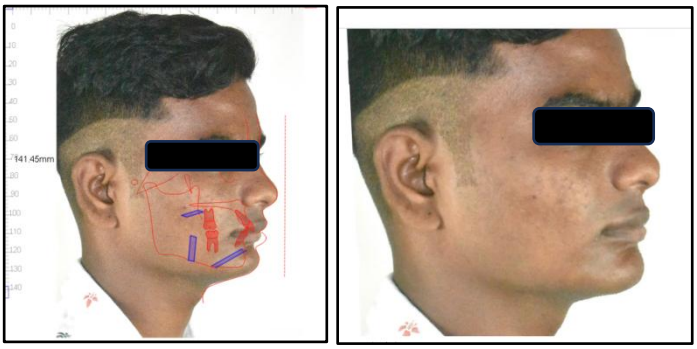

Fig 3: Digital Prediction Tracings

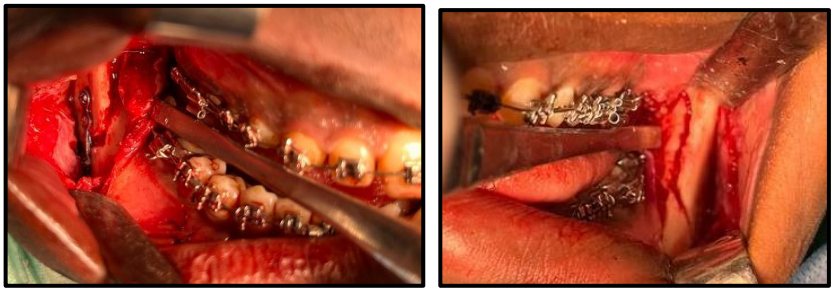

Fig 4: Bilateral sagittal split osteotomy

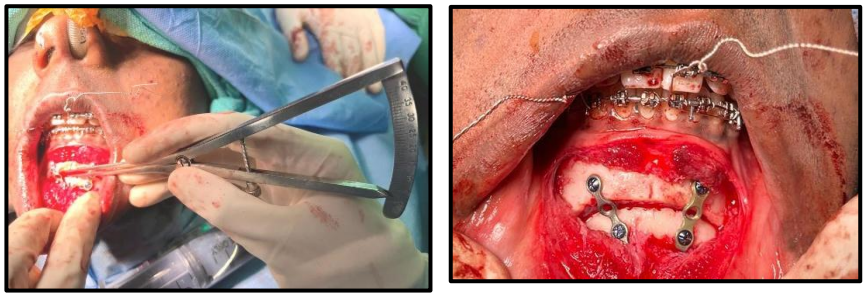

Fig 5: Reduction sliding genioplasty

Fig 6: Post surgical splint placed with Class II elastics

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Fig 7: Post surgical orthodontics

Fig 8: Post treatment facial and intraoral photograph

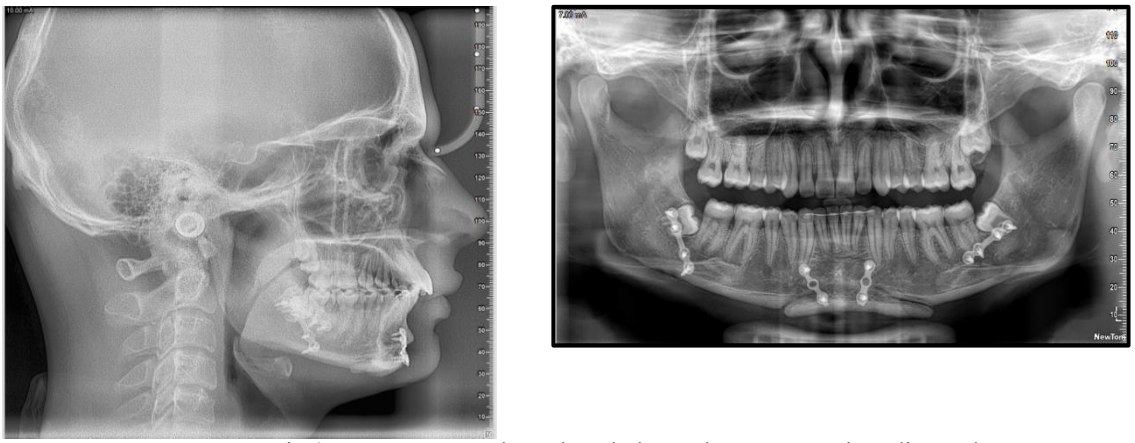

Fig 9: Post treatment lateral cephalograph & panoramic radiograph

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Table 1: Lateral cephalometric measurements

Parameters	Pre treatment	Post Treatment
SNA	82°	82°
SNB	77°	80°
ANB	5°	2°
WITS	5 mm	2 mm
UI-NA	40°(8mm)	32°(5mm)
LI-NB	30°(4mm)	28°(3 mm)
GoGn-SN	18°	20°
FMA	14°	16°
IMPA	110°	105°
LAFH : AFH	54%	57%
Pog-Na Vertical	-5 mm	0 mm
Nasolabial angle	120°	120°

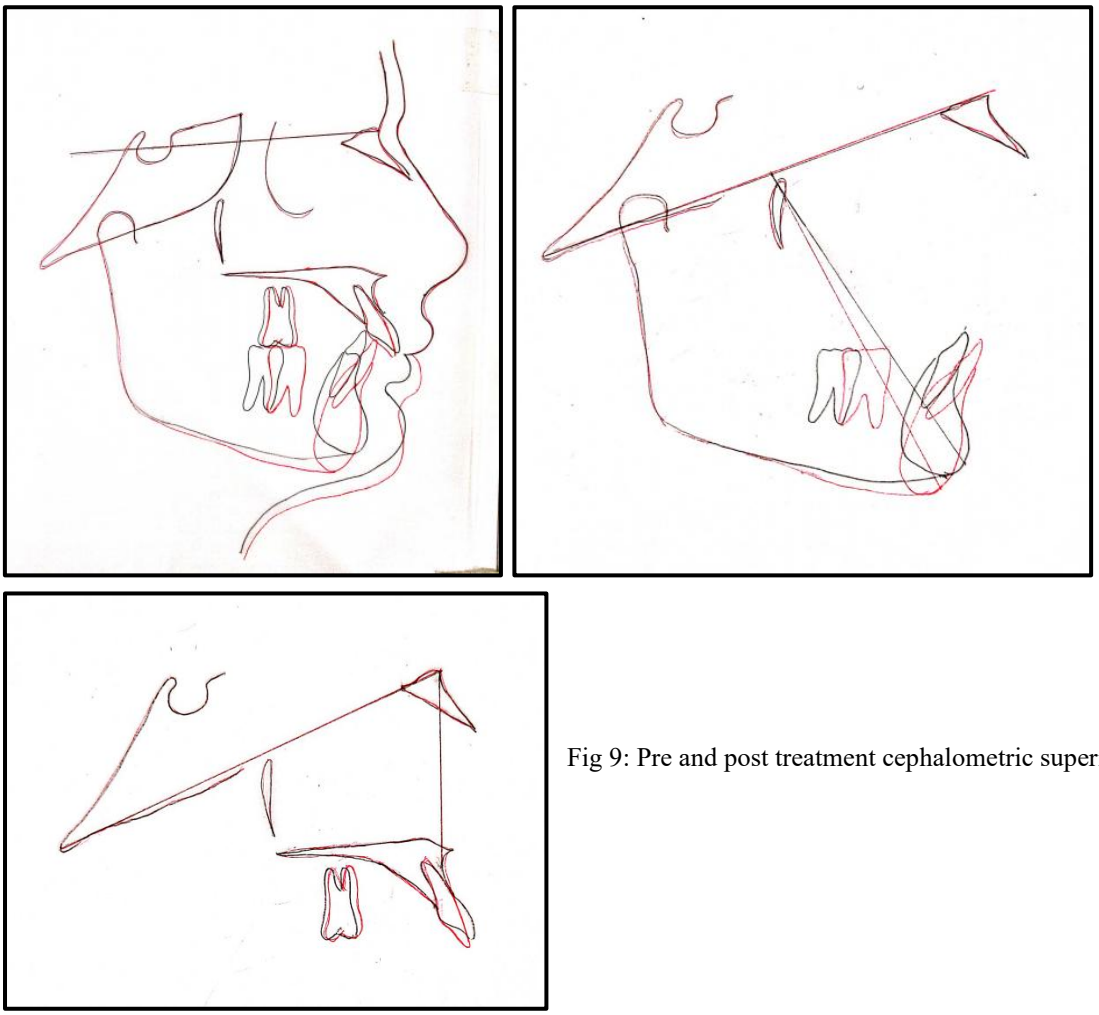

Fig 9: Pre and post treatment cephalometric superimposition

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III. TREATMENT RESULTS

Post surgical facial appearance and profile of the patient significantly enhanced. Patient became confident and compliant for his further orthodontic visits. The correction of sagittal discrepancy was achieved, lower anterior facial height proportion was normalized along with enhancement of lip relation, chin projection and mentolabial sulcus. The chief complaint of impinging deep bite and facial appearance were resolved after surgical phase.

After completion of post orthodontic phase Class I molar, canine and incisor relationship was obtained, overjet and overbite correction was achieved, dental midline coincided with the facial midline. Total treatment time was around 9 months. Superimposition of cephalometric tracings showed that mandible moved anteriorly by 6mm and rotated clockwise with opening of mandibular plane (GoGn) by 2º.

Chin prominence was improvised due to a combination of clockwise rotation and reduction genioplasty with enhanced lip chin relation. Inclination correction of upper incisors was evident with reduction of overjet by 9mm and overbite by 80%. UI NA reduced from 40º(8mm) to 32º(5mm). ANB reduced from 5º to 2º, LI NB reduced from 30º(4mm) to 28º(3mm) and LAFH to AFH ratio increased from 54% to 57%. [Fig 4 & Table 1] Follow-up examinations demonstrated stable skeletal and dental parameters with a harmonious occlusion.

IV. DISCUSSION

This case demonstrates surgery first approach for treating Class II malocclusion due to mandibular retrognathism. This plan was chosen to address the chief complaint of deep impinging bite and mandibular deficiency earlier during treatment.

Conventionally orthodontic first surgery approach emphasized on the importance of levelling and alignment, eliminating dental interference, decompensating incisor position and arch coordination. The 2011 guidelines showed that well aligned to mild crowding, mild to flat curve of spee and mild to normal compensation of incisors inclination were indicated for surgery first approach.[9,10] It was observed that the patient had minor intra arch discrepancies in the form of dental midline shift and spacing. These dental discrepancies could be treated in the post surgical phase.

During mock surgery there was neither any occlusal interference nor any transverse discrepancy observed. Digital Visual Treatment Objective on Nemoceph Cephalometric Software illustrated enhancement of profile after a combination of 6 mm mandibular advancement and 3mm reduction of genium.

Moreover, a case of skeletal Class II with hypodivergent growth pattern, deep impinging bite and excessive curve of spee is expected to have heavy occlusal forces originating from strong masticatory muscles. Deprogramming the muscle by orthognathic surgery could be accompanied by surgery first approach. Surgery first approach also takes advantage of the regional acceleratory phenomenon (RAP) which would be beneficial in the post surgical orthodontic phase.

Whenever mandibular advancement is planned surgically, lower anterior face height must be considered. In this case, low mandibular plane angle and prominent chin were noted. Therefore, clockwise rotation of the mandible was done surgically to increase lower face height and decrease the chin prominence while advancing the mandible.

In patients with short anterior facial height and skeletal deepbite, it is preferable to level the curve of Spee after mandibular advancement by adopting the mandibular “tripod” advancement method.[11,12] By maintaining initial deep curve of Spee, we advanced the mandible to an edge-to-edge incisors contact, along with the bilateral most posterior teeth occluded, to form a tripod occlusion, which ensures to maximize lower anterior facial height during orthognathic surgery. Later, during post surgical orthodontics phase the transient lateral open bite is levelled by guided eruption of the posterior teeth.

Surgical stability was enhanced with the use of class II elastics which reduces the load potential. It counters any stretching of muscles of mastication and also allows for soft tissue relaxation. The increase in loading of TMJ caused by counterclockwise rotation normalizes gradually in few months after the joint adapts to its new position.

V. CONCLUSION

This case depicts a favourable outcome by addressing skeletal class II due to retrognathic mandible with a hypodivergent craniofacial growth pattern treated by surgery first approach followed by the orthodontic phase for improved psychosocial satisfaction of the patient, significantly improved facial aesthetics and a harmonious occlusion. The sagittal and vertical discrepancy was corrected with achievement of Class I molar, canine and incisor relationship and optimization of overjet, overbite.

DECLARATION OF PATIENT CONSENT

The authors certify that they have obtained all appropriate patient consent.

CONFLICT OF INTEREST

There is no conflict of interest.

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