Iran J Orthod. 2023 June; 18(1):e1105. doi:10.22034/IJO.2023.1990357.1105.
Published online 2023 June 1
**Research Article** **Open Access**

# Bi-jaw Surgical Correction of Skeletal Class III Malocclusion with Anterior Open Bite using "Minimal Presurgical Orthodontic" Approach: A Case Report

**Harshikkumar Arvindbhai Parekh[1*], Rahul Anil Trivedi[1], Falguni Mehta[2], Renuka Patel[3], Nipa Prajapati[1], Shekhar Asarsa[4]**

[1] Assistant Professor, Department of Orthodontics, Government Dental College and Hospital, Ahmedabad, Gujarat, India
[2] Professor & Head, Department of Orthodontics, Government Dental College and Hospital, Ahmedabad, Gujarat, India
[3] Professor, Department of Orthodontics, Government Dental College and Hospital, Ahmedabad, Gujarat, India
[4] Ex-Post Graduate Student, Department of Orthodontics, Government Dental College and Hospital, Ahmedabad, Gujarat, India

***Corresponding author:** Harshikkumar Arvindbhai Parekh

**Address:** Department of Orthodontics, Government Dental College and Hospital, Ahmedabad-380016, Gujarat, India.
**E-mail:** harshikp@yahoo.com

**Received:** 2023 February 27; **Revised:** 2023 May 01; **Accepted:** 2023 May 20

## Abstract

**Aim:** Traditional orthognathic surgery typically requires prolonged and extensive orthodontic treatment before surgery, followed by a shorter postoperative orthodontic phase. The pre-surgical orthodontic period is lengthy and can lead to a decline in facial aesthetics due to decompensation. Consequently, patients' mental health could decline, and they could lose confidence as a result of these changes. To address the issue of deteriorating facial soft tissues during early decompensation and to reduce the risk of unstable postoperative occlusion, the surgery-first approach (SFA) or minimal presurgical orthodontics (MPO) has been introduced. MPO is designed to minimize occlusal interference and enhance arch coordination for surgery, thereby increasing the predictability of surgical outcomes.
**Case Description:** An 18-year-old male patient with skeletal class III malocclusion and an anterior open bite was treated using MPO. A modified transpalatal arch (TPA) was applied before surgery to rectify a projected post-surgical buccal scissor bite involving the maxillary second molar. After achieving this correction, the patient underwent bi-jaw surgery.
**Conclusion:** This approach, in contrast to the conventional method, involved brief orthodontic tooth movement without negatively impacting the patient's profile or decompensation. The patient was highly satisfied and delighted with the outcome.

**Keywords:** Minimal presurgical orthodontics (MPO), Skeletal Class III, Open bite.

## Background

With the introduction of orthognathic surgery in the 1960s, surgeons initially were following a surgery-first approach to address all skeletal discrepancies without presurgical orthodontic interventions (1). This approach was not without problems like unstable postoperative occlusion leading to severe masticatory problems and relapse (2-4). Surgeons and orthodontists eventually realized that dental compensations needed to be corrected for optimal positioning of the jaws with surgery. Hence, first applying the orthodontic approach became widely accepted to treat skeletal discrepancies, and reasonably stable occlusion and satisfactory treatment outcomes were achieved (5). Conventional orthognathic surgery involves presurgical extensive and lengthy

Copyright © 2023, Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (http://creativecommons.org/licenses/by-nc/4.0/) which permits copy and redistribute the material just in noncommercial usages, provided the original work is properly cited.

orthodontic treatment followed by surgery and short post-surgery orthodontics. The orthodontic presurgical phase is longer and decompensation can lead to worsening of facial esthetics (6,7). Patients do not like such changes and become anxious and tend to lose their confidence.

Recently, the surgery-first approach (SFA), also referred to as minimal presurgical orthodontics (MPO) has been introduced to overcome problems of worsening of facial soft tissues in the early phase of decompensation and to decrease chances of unstable postoperative occlusion. MPO is suggested to minimize occlusal interference and arch coordination for surgery to increase the predictability of surgical results (8,9,10). This case report illustrates a skeletal class III malocclusion in a young adult treated with MPO and bi-jaw surgical intervention.

## Case Description

An 18-year-old male presented with the chief complaint of forwardly placed lower jaw and inability to cut from the front teeth (Fig.1). His family and medical history were nonsignificant, and his dental history revealed amalgam fillings in lower molars on both sides.



**Figure 1:** Surgical prediction on cephalometric

**Photographic Analysis**

Profile of the soft tissue analysis suggested maxillary hypoplasia, malar deficiency, and a concave profile with marked mandibular prognathism. The front face depicted an oval outline with an increased lower 2/3. Smile analysis revealed a non-consonant smile arc, decreased upper incisor display, along with the absence of an overbite. Intraorally, both molars were in Angle's class III along with class III canines bilaterally. Both the arches were reasonably aligned; however, mild crowding, and both upper second molars were in the buccal scissor-bite. Midlines were matching with the facial midline. There was a reverse overjet of 6 mm and 3 mm of open bite. All third molars were present intraorally in all quadrants.

**Cephalometric Analysis**

Analysis showed a severe skeletal class III pattern (ANB -7°, Beta Angle 50°) due to maxillary hypoplasia (SNA 78°) and mandibular prognathism (SNB 85°). Maxillary incisors were proclined and forwardly placed (U1 to NA 34° and 9 mm). Mandibular incisors

were slightly retroclined (L1 to NB 24° and 5mm, IMPA 82°). Both upper and lower incisors were naturally compensated for true skeletal class III.

**Treatment Objectives**

To correct skeletal discrepancy and facial concavity and achieve skeletal class I.

To achieve smile consonance and improve facial esthetics.

To achieve and maintain Angle's class I molars and canines bilaterally.

To level and align the arches and achieve ideal overjet and overbite.

Overall objectives were to have proper function and stability along with aesthetics.

**Treatment Progress**

The patient was given the following options:

1. Conventional orthodontic and orthognathic treatment.
2. Minimum pre-surgical orthodontics.

The patient did not desire to have a worsening of his facial appearance and preferred to have a positive change in his appearance as early as possible. Therefore, it was proposed to go for minimal orthodontics followed by surgery at the earliest time possible. Hence, the whole treatment consisted of three stages: 1) minimum presurgical orthodontics, 2) the surgical phase, and 3) post-surgical orthodontics.

Immediately after preparing the records, the patient was sent for the removal of all wisdom teeth. Upper and lower models were articulated as pre surgical planning based on the cephalometric surgical treatment objective (STO) (Fig. 2) before commencing any treatment in the occlusal interference that could potentially compromise the stability of the surgical procedure. Palatal cusps of upper second molars on both sides were extruded, which were major areas of fulcrum and made the occlusion unstable on the articulated models. Hence, it was required to correct occlusal interference as part of the minimum presurgical orthodontic procedure before undergoing orthognathic surgery. A modified transpalatal arch (TPA) (Fig. 3) was delivered and cemented to correct extruded palatal cusps of second maxillary molars. An E- chain was stretched from the buccal tubes of the molar bands to the extended wire of the modified TPA on the palatal side.

patient. This task was carried out to check for any

After correction of the maxillary molars inclination, both arches were bonded with brackets (MBT 0.022), and 0.016" nitinol wires were placed. On the fifteenth day, the patient was taken for surgery. Kobayashi hooks were made from 0.09" SS ligature wire and ligated around the brackets to facilitate elastics usage. The patient showed 6 mm of reverse overjet. STO and mock surgery (Fig. 4) on the articulated models suggested a sagittal correction of 8 mm that included 2 mm for positive overjet. Sagittal 10 mm jaw movements were planned, keeping some relapse into consideration, and movements were divided into 4 mm maxillary forward and 6 mm mandibular setback movement. Two surgical splints, intermediate and final, were prepared as guides during surgery (Fig. 5). Surgical procedures consisted of Le Fort I osteotomy for maxillary advancement and bilateral sagittal spilt osteotomy for mandibular set back with counterclockwise rotation and settling into normal overbite (Fig. 6). The post-surgical orthodontic phase was initiated after 15 days of surgery. This phase involved leveling, alignment, decompensation, and settling of the occlusion (Fig. 7 and 8) with subsequent wires and elastics. Wire progression was until 0.019"× 0.025" SS. The patient was given a chin cup to wear at night immediately after surgery (Fig. 9).

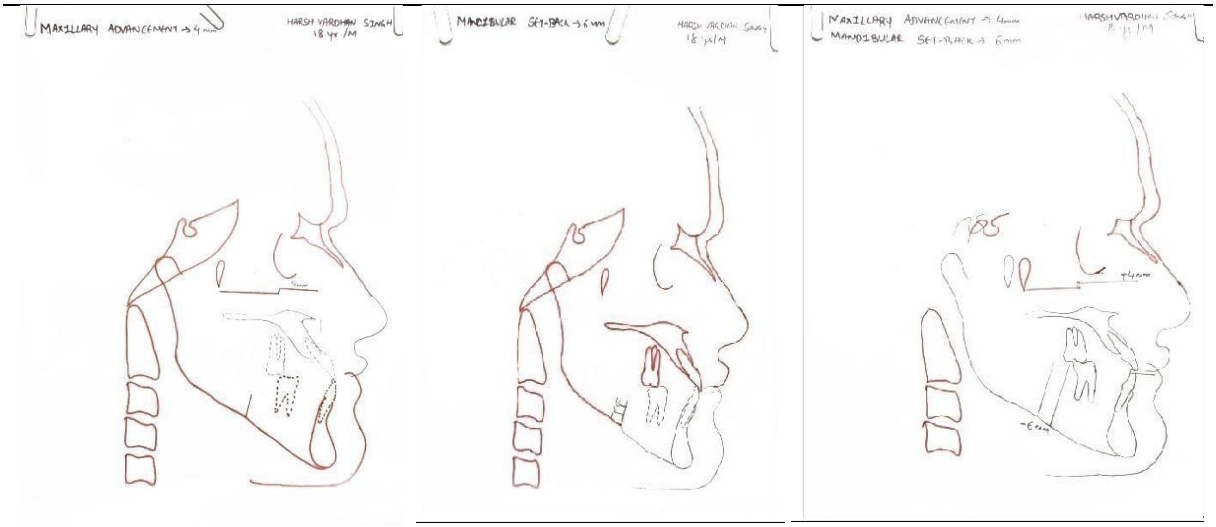



**Figure 2:** An 18-year-old male patient with skeletal class III malocclusion pre-treatment



**Figure 3:** Modified TPA constructed with 0.9 mm stainless steel wire.

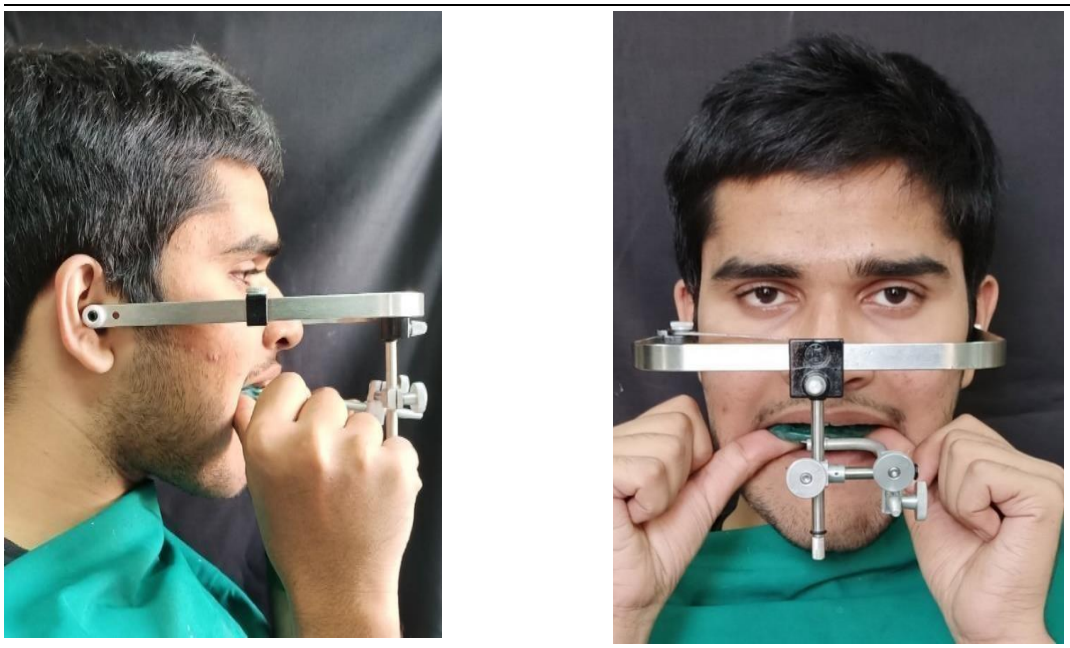


**Figure 4:** A Face bow transfer

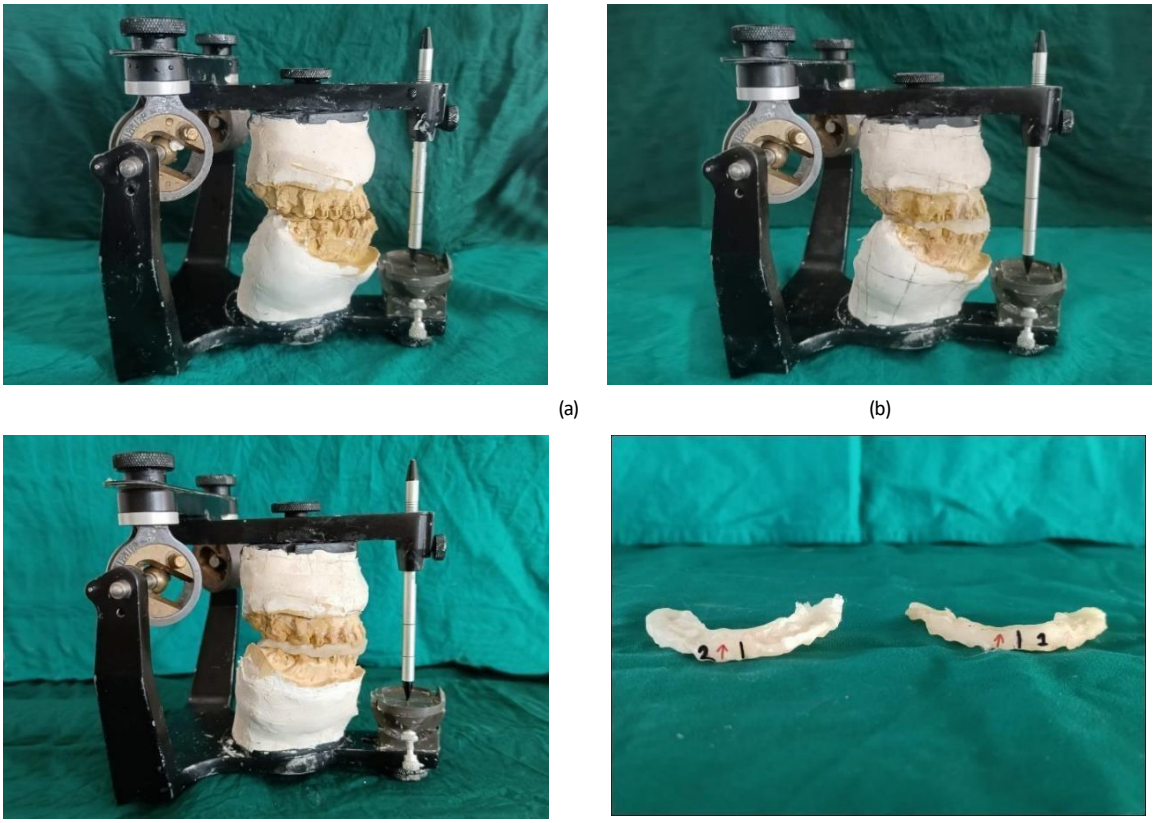


**Figure 5:** Mock Surgery (a) Articulated models (b) Maxillary advancement and splints in place (c) Final splint after mandibular setback (d) Surgical Splint

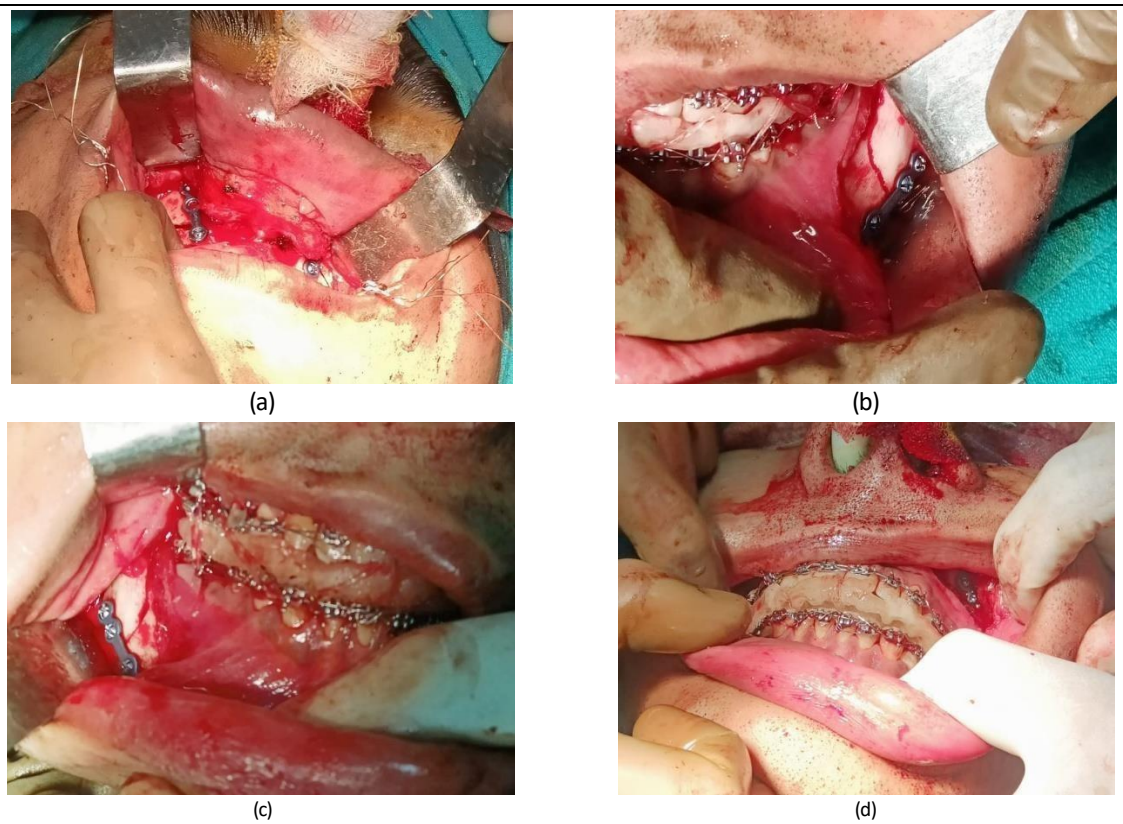


**Figure 6: (a).** Le Fort I osteotomy **(b and c).** Bilateral sagittal split osteotomy (d). Final splint in place



**Figure 7:** Extraoral postsurgery photographs

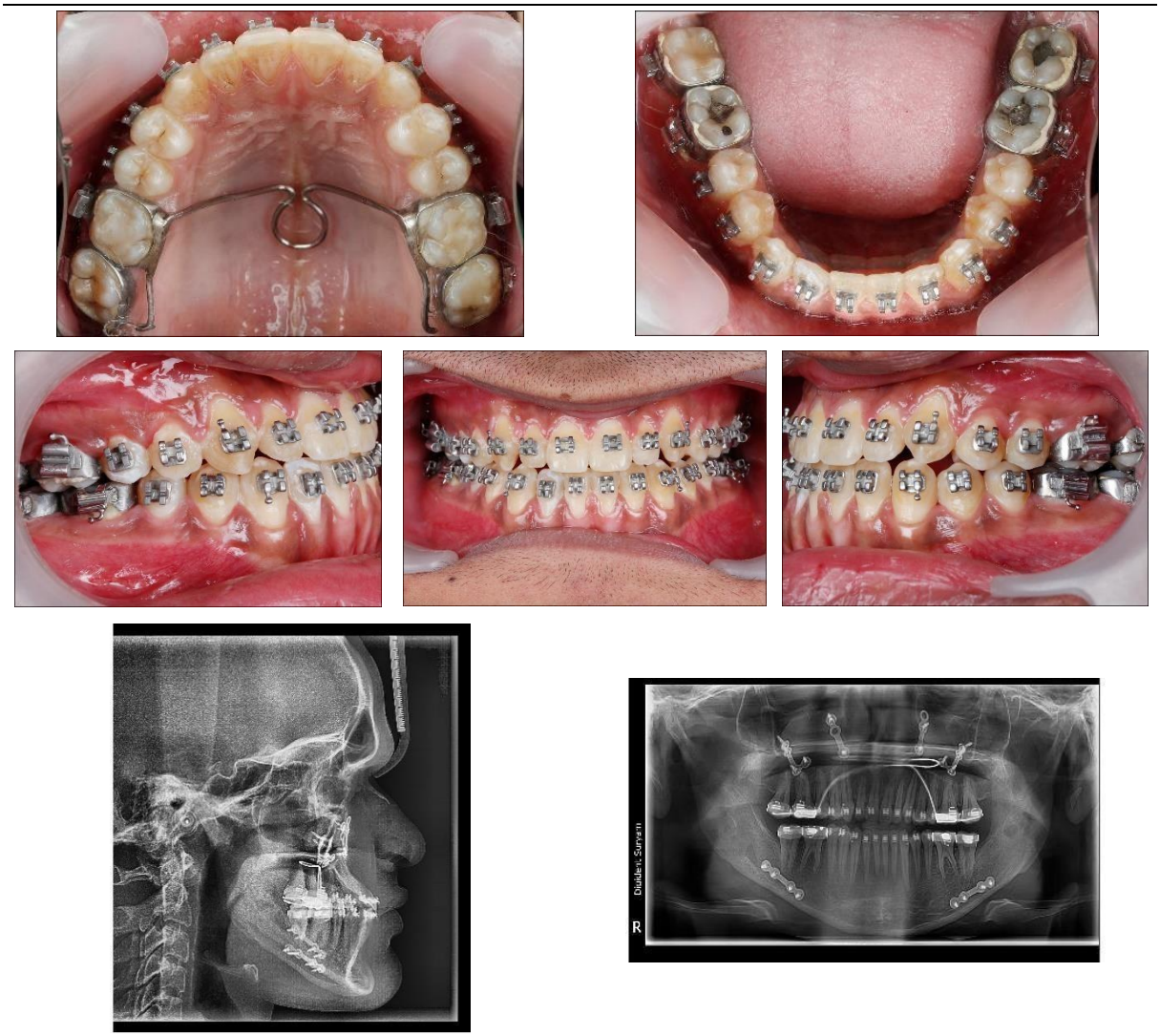


**Figure 8:** Immediate postsurgical intraoral photographs, cephalogram, and OPG



**Figure 9:** Chin-cap for night time wear

## Results

There was a marked improvement in the patient's facial profile. Molar and maxillary deficiency, mandibular prognathism, and anterior open bite were corrected. A consonant smile arc was also achieved. Intraorally, the patient displayed class I canines and molars with normal overjet and overbite (Figure.10). Cephalometric readings (Table 1) showed marked improvement of the ANB from -7° to 3° attributed to improvement in the SNA (from 78° to 82°) and SNB (from 85° to 79°). The patient was immensely delighted with the final outcomes. The superimpositions (Figures 12 and 13), in both cephalometric and photographic reports, revealed significant improvement in the soft and hard tissues. The patient did not show any TMJ symptoms and no TMJ changes were found on the radiograph. The whole treatment was completed within a 12-month duration.

**Table1.** Cephalometric Analysis

| Measurement | Pre-treatment value | Post-debonding value |
|---|---|---|
| SNA | 78° | 82° |
| SNB | 85° | 79° |
| ANB | -7° | 3° |
| Beta Angle* | 50° | 33° |
| IMPA | 82° | 79° |
| U1 to NA | 34° and 9 mm | 30° and 4 mm |
| L1 to NB | 24° and 5 mm | 23° and 4 mm |
| Y-axis | 68° | 65° |
| ANS-GN Vertical Distance | 67 mm | 62 mm |

* The angle formed between the A-B line and the perpendicular through point A from the apparent axis of the condyle.

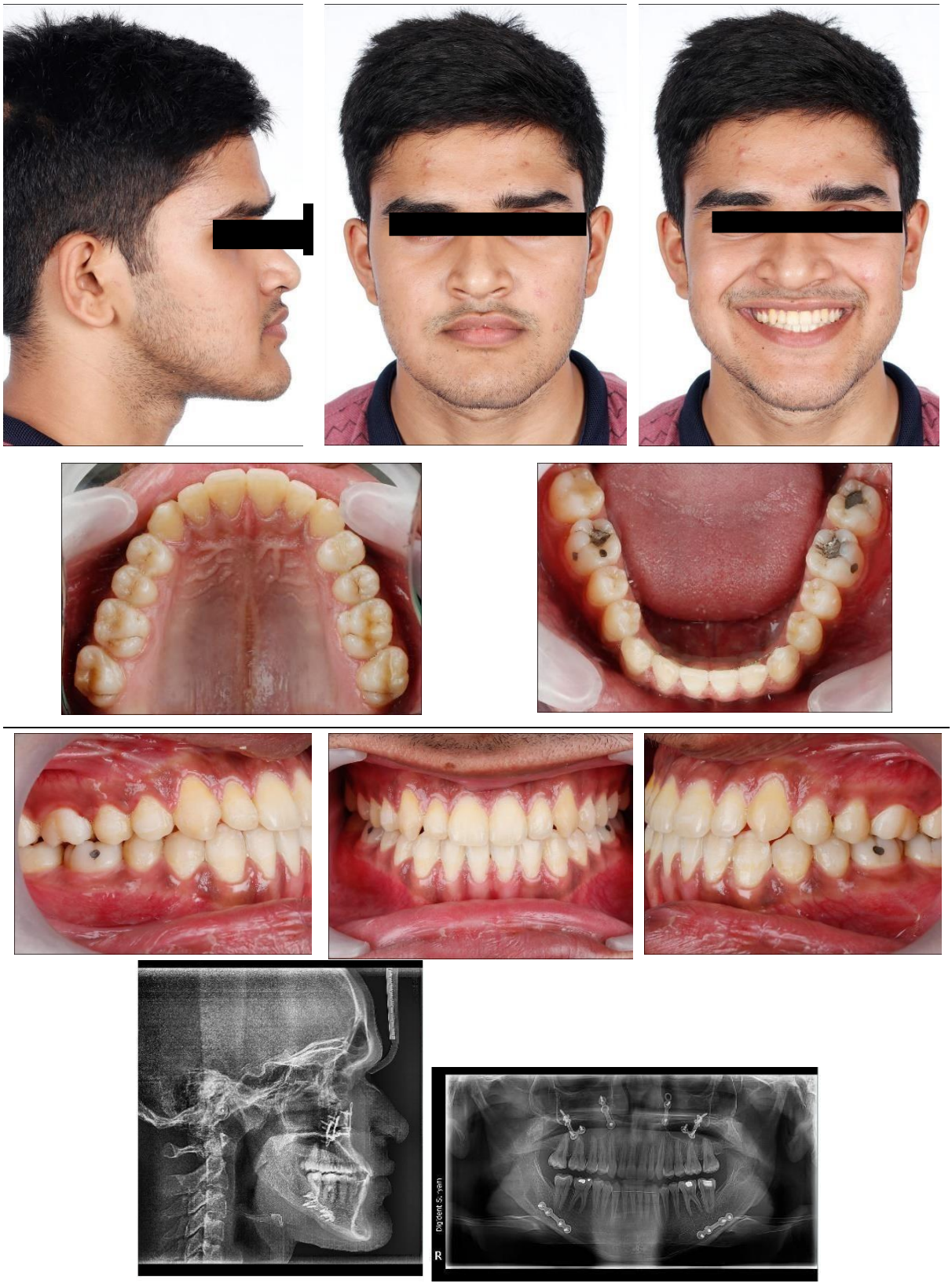



**Figure 10:** Post-debonding intraoral photographs, cephalogram and OPG.

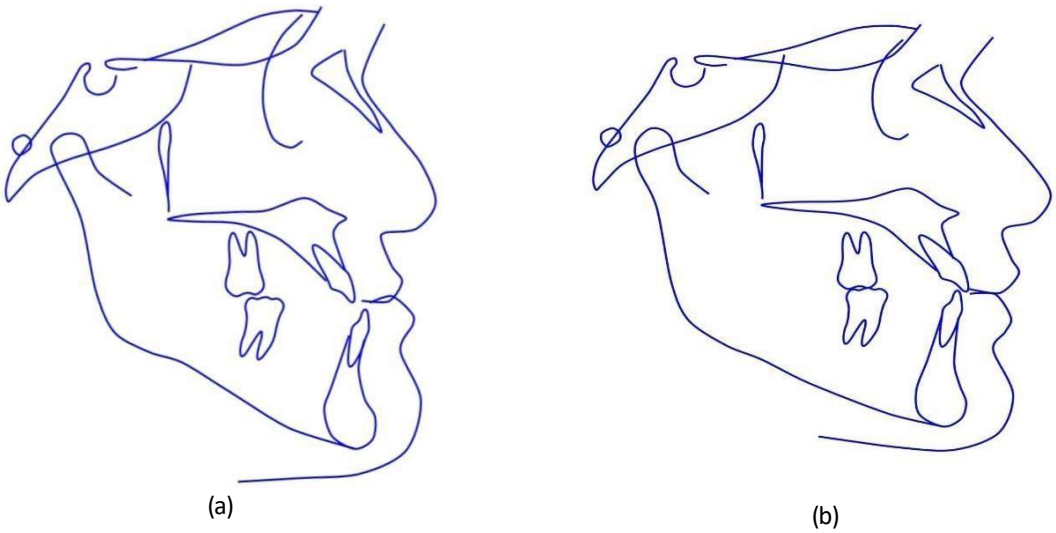



**Figure 11:** (a) Pre-treatment cephalometric tracing. (b) Post-debonding cephalometric tracing

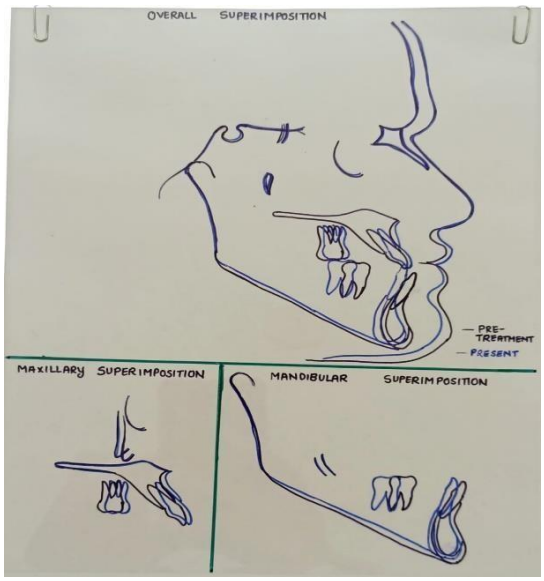



**Figure 12:** Pre-treatment and post-debonding cephalometric superimposition (Black: Pre-treatment, Blue: Post-debonding)



**Figure 13:** Comparison of profile view: pre-treatment, immediate post-surgery, and post-debonding



**Figure 14 Continue:** 12-month follow up extra and intra oral photographs

## Discussion

Nagasaka et al. (11) suggested the "surgery-first" approach that typically involves orthognathic surgery without presurgical orthodontic treatment. However, occlusal interference at the end of or during surgery poses a significant threat to the stability of the result. Correction of such interferences is an important and integral part of the presurgical orthodontic phase in both the conventional as well as the "surgery-first" approach. Conventional surgical orthodontic treatment recommends decompensation, and this would increase the existing discrepancy and worsen facial esthetics and oral functions. This may elicit a negative effect on a patient's psychological state. Moreover, a compensated dentoalveolar segment is a physiological response to a skeletal discrepancy, and any attempt to decompensate during presurgical orthodontics can be in contradiction of physiology. MPO or SFO improves the facial profile and esthetics very early in the treatment and induces the patient's satisfaction and confidence. This immensely helps in achieving patient cooperation during the postsurgical orthodontic phase. Furthermore, there can be a synergistic effect between the orthodontic force and the newly established adaptive force from soft tissues that would bring about physiological dentoalveolar decompensation (12,13). The patient had a concave facial profile with a marked mandibular prognathism and maxillary hypoplasia with an anterior open bite. Two-jaw surgery was recommended to achieve greater change in the

ANB and to correct the midfacial deficiency (14). To deal with skeletal relapse, rigid fixation and a chin-cap were used, which was advised for night time wear. Post-debonding 12-month follow- up images showed stable surgical results.

## Conclusion

Proper case selection is crucial for the MPO approach. With accurate diagnosis, MPO can provide an effective and efficient alternative to the conventional orthodontic-orthognathic treatment approach.

## Informed consent

The authors certify that they have obtained all appropriate patient consent forms. In the forms, the patient gave his consent for his images and other clinical information to be reported in the Journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

## FINANCIAL SUPPORT AND SPONSORSHIP

Nil

**Conflicts of Interest:** None to declare.

## References

1. Poulton DR, Taylor RC, Ware WH. Cephalometric x-ray evaluation of the vertical osteotomy correction of mandibular prognathism. Oral Surg Oral Med Oral Pathol.1963;16:807-20. doi: 10.1016/0030-4220(63) 90319-0.
2. Behrman SJ, Behrman DA. Oral surgeons' considerations in surgical orthodontic treatment. Dent Clin North Am. 1988; 32:481-507.
3. Tompach PC, Wheeler JJ, Fridrich KL. Orthodontic considerations in orthognathic surgery. Int J Adult Orthodon Orthognath Surg. 1995;10(2):97-107.
4. Troy BA, Shanker S, Fields HW, Vig K, Johnston W. Comparison of incisor inclination in patients with Class III malocclusion treated with orthognathic surgery or orthodontic camouflage. Am J Orthod Dentofacial Orthop. 2009;135:146.el-9. doi: 10.1016/j. ajodo.2008.07.012.
5. Uribe F, Janakiraman N, Shafer D, Nanda R. Three-dimensional cone-beam computed tomography-based virtual treatment planning and fabrication of a surgical splint for asymmetric patients: surgery first approach. Am J Orthod Dentofacial Orthop. 2013; 144(5):748-58. doi: 10.1016/j.ajodo.2012.10.029.
6. Luther F, Morris DO, Hart C. Orthodontic preparation for orthognathic surgery: how long does it take and why? A retrospective study. Br J Oral Maxillofac Surg. 2003;41(6):401-6. doi: 10.1016/s0266-4356(03)00163-3.
7. Arnett GW, Jelic JS, Kim J, Cummings DR, Beress A, Worley Jr CM, et al. Soft tissue cephalometric analysis: diagnosis and treatment planning of dentofacial deformity. Am J Orthod Dentofacial Orthop. 1999;116(3):239-53. doi: 10.1016/s0889-5406(99)70234-9.
8. Baek SH, Ahn HW, Kwon YH, Choi JY. Surgery-first approach in skeletal class III malocclusion treated with 2-jaw surgery: evaluation of surgical movement and postoperative orthodontic treatment. J Craniofac Surg. 2010;21(2):332-8. doi: 10.1097/SCS.0b013e 3181cf5fd4.
9. Ko EW, Hsu SS, Hsieh HY, Wang YC, Huang CS, Chen YR. Comparison of progressive cephalometric changes and postsurgical stability of skeletal Class III correction with and without presurgical orthodontic treatment. J Oral Maxillofac Surg. 2011;69(5):1469-77. doi: 10.1016/j. joms.2010.07.022.
10. Wang YC, Ko EW, Huang CS, Chen YR, Takano-Yamamoto T. Comparison of transverse dimensional changes in surgical skeletal Class III patients with and without presurgical orthodontics. J Oral Maxillofac Surg. 2010;68(8):1807-12. doi: 10.1016/j.joms.2009.09.089.
11. Nagasaka H, Sugawara J, Kawamura H, Nanda R. "Surgery first" skeletal Class III correction using the Skeletal Anchorage System. J Clin Orthod. 2009;43(2):97-105.
12. Choi JW, Bradley JP. Surgery first orthognathic approach without presurgical orthodontic treatment: questions and answers. J Craniofac Surg. 2017;28(5):1330- 33. doi:10.1097/SCS.0000000000003733.
13. Jeong WS, Choi JW, Lee JY, Kwon SM. Can a surgery-first orthognathic approach reduce the total treatment time? Int J Oral Maxillofac Surg. 2017;46(4):473-82. doi: 10.1016/j.ijom.2016.12.006.
14. Johnston C, Burden D, Kennedy D, Harradine N, Stevenson M. Class III surgical-orthodontic treatment: a cephalometric study. Am J Orthod Dentofacial Orthop. 2006;130(3):300-9. doi: 10.1016/j.ajodo.2005.01.023.