

# Interdisciplinary orthognathic treatment of high angle class III malocclusion

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## Abstract

For Class III adult patients, combined treatment strategy must be followed which includes either further dentoalveolar compensation or orthognathic surgery following decompensation of the teeth. This case report presents the interdisciplinary approach of a skeletal Class III malocclusion with increased vertical facial dimension, occlusal cant, extracted posterior teeth on the right upper and left lower segments, extensive restorations, and total circular crossbite. The orthodontic alignment took 10 months. LeFort 1 osteotomy with 7 mm advancement, 5 mm impaction on the left side, 3 mm impaction on the right side and 2 mm rotation for midline correction toward the left side, 3 mm set-back of mandible with bilateral sagittal split osteotomy were done. The surgery simulation, postoperative and 2-year follow-up records were compatible. The treatment was finalized in a straight profile with stable occlusion and good smile characteristics without airway disturbance.

**Key words:** Interdisciplinary treatment, orthognathic surgery, skeletal Class III

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## Introduction

In order 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.<sup>[1]</sup> In order to come up with treatment alternatives for such patients, an interdisciplinary approach is required.<sup>[2]</sup> The objective of this article is to present the orthognathic and prosthodontic treatment of skeletal Class III malocclusion in an adult patient with increased vertical facial dimension, occlusal cant, extracted posterior teeth on the right upper and left lower segments, extensive restorations, and total circular crossbite.

## Case Report

A 31-year-old man was referred to the Orthodontics Clinic with the chief complaint of “my chin is sticking out”,

pointing to his protrusive mandible. The patient specified his esthetic and functional problems, especially related to chewing and breathing. He had no systemic or temporomandibular joint problem in his medical history. On extraoral examination [Figure 1] while smiling, he had buccal corridors and a slight gummy smile; also a concave facial profile with evidence of paranasal depression. In the intraoral [Figure 1] examination, there was a Class III dental relationship with a 2 mm overbite, and a 2 mm negative overjet. Dental midlines were coincident with each other and were 2 mm to the right of the facial midline. The absence of his maxillary right premolars and first molar with mandibular left second premolar and first molar complicated his malocclusion. The teeth at the left maxillary segment had erupted causing a cant of the occlusal plane. Even though there was circular crossbite, in the correct sagittal relationship of the dentition there was no transverse problem. Lateral cephalometric radiograph and tracing [Figure 2]

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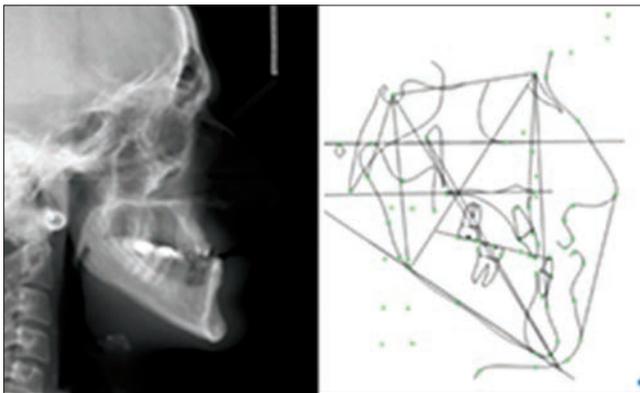
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**Figure 1:** Pre-treatment intra and extraoral photographs of the patient

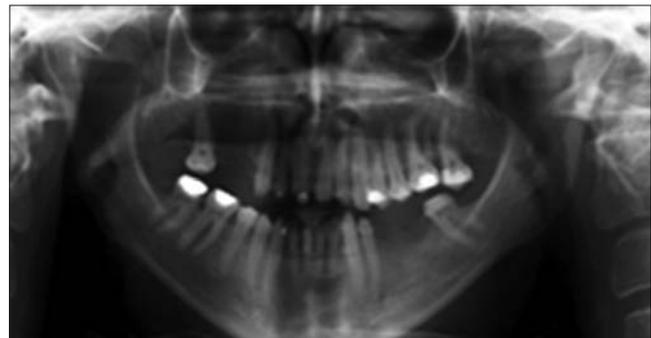


**Figure 2:** Pre-treatment lateral cephalometric radiograph and the tracing of the patient

revealed maxillary retrognathism, mandibular prognathism, and slight retrusion of maxillary and mandibular incisors. The panoramic radiograph [Figure 3] showed that no bone or dental pathology but extensive restorations.

Since the patient was not a borderline case for Class III compensation treatment,<sup>[3]</sup> the alternative treatment of orthognathic surgery was proposed to the patient. After a detailed explanation of this treatment, consent was obtained from the patient. He was also informed that his breathing problem could be improved in this case by an airway volume increase.<sup>[4]</sup>

The pre-operative orthodontic alignment took 10 months, during which all archwires were coordinated

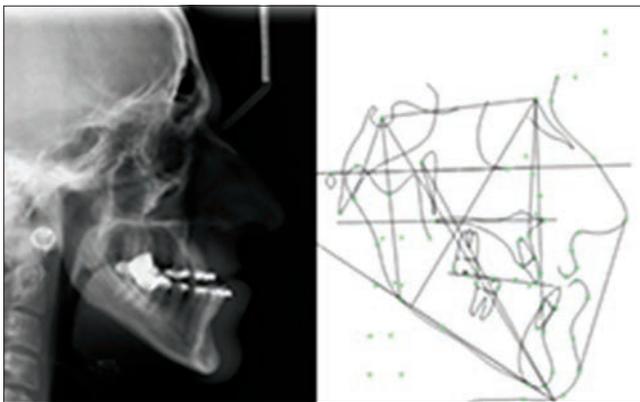


**Figure 3:** Pre-treatment panoramic radiograph of the patient

[Figure 4]. The planning was done on a pre-operative lateral cephalogram [Figure 5] by using Dolphin software (Dolphin Imaging and Management Solutions, Chatsworth, CA, USA). The panoramic radiograph shows the parallel root angulations of teeth [Figure 6]. The surgical treatment summary was as follows: Maxillary one piece LeFort 1 osteotomy with 7 mm advancement, 5 mm impaction on the left side, 3 mm impaction on the right side and 2 mm rotation for midline correction toward the left side, and 3 mm set-back of mandible with bilateral sagittal split osteotomy. The patient wore the final splint used during surgery with intermaxillary elastics for 1 week postoperatively. For the next 2 weeks, the patient used the elastics except for meals. In the 4<sup>th</sup> week, the splint was untied, and the patient used the intermaxillary elastics during night time with very light force just to help keep the splint in place. The final result was retained with Hawley retainers [Figure 7]. The



**Figure 4:** Pre-operative extra- and intra-oral photographs of the patient



**Figure 5:** Pre-operative lateral cephalometric radiograph and the tracing of the patient



**Figure 6:** Pre-operative panoramic radiograph of the patient

patient decided to have fixed full mouth prostheses at the end of orthodontic treatment.

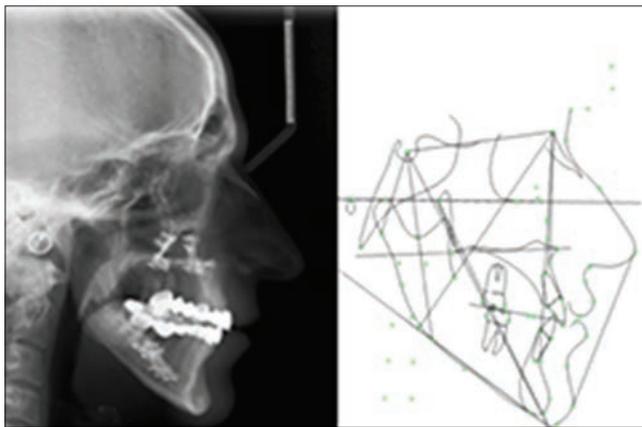
Posttreatment photographs [Figure 7] show improvement of the profile and occlusal relationships [Figure 7]. The fixed prostheses were esthetically and functionally satisfactory. The postoperative cephalometric [Figure 8] and panoramic radiographs [Figure 9] show the healthy postoperative situation. There was no root resorption or interradicular bone level decrease associated with orthodontic therapy seen on panoramic radiographs [Figure 9]. Lateral cephalometric superimpositions [Figure 10] reveal that, without too much change in the total vertical other than a slight decrease of the lower facial height, the patient had a Class I skeletal relationship (ANB 4°, Witts appraisal -2.6 mm) [Table 1].

## Discussion

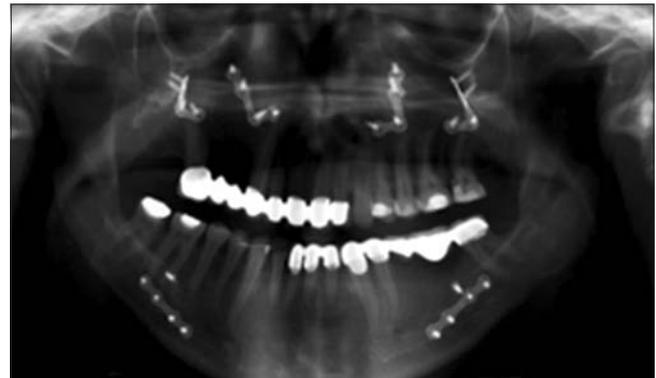
The posterior airway volume of the patient was altered by the advancement of the maxilla, which helped to decrease the amount of airway obstruction.<sup>[5,6]</sup> In Class III patients, instead of mandibular set-back operations, advancement of the maxillary bone is advised since this approach has a positive effect on the size and function of the posterior airway space – which has an effect on breathing. Furthermore, this is reported to be the most stable movement by means of airway dimension improvement. A combination of these options is bimaxillary surgery, which is recommended for skeletal Class III patients. This approach would increase the upper part of the airway and decrease the lower part, but would not change the total volume.<sup>[7]</sup> The decreased space in the nasal cavity, as a result, of superior positioning of the maxilla was eliminated by reduction of the septal maxillary crest and nasal spine, and deepening the bony part of the both nasal



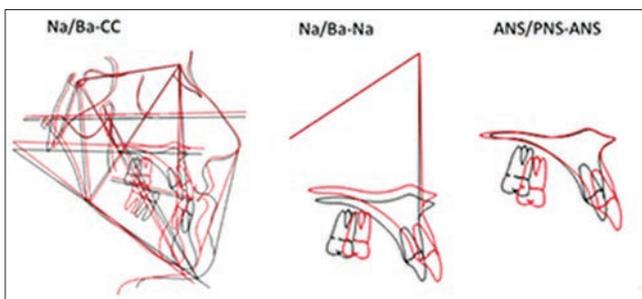
**Figure 7:** Post-treatment extra-and intra-oral photographs of the patient



**Figure 8:** Post-treatment lateral cephalometric radiograph and the tracing of the patient



**Figure 9:** Post-treatment panoramic radiograph of the patient



**Figure 10:** Superimposition of the pre- and post-treatment lateral cephalometric radiograph on Na/Ba-CC, Na/Ba-Na and ANS/PNS-ANS

floors with a burr. The patient underwent double jaw surgery, as opposed to only having an operation on the maxilla, mainly because of the huge amount of negative overjet that could have been hard to eliminate by just moving the maxilla forward more than 6 mm. This would have indeed been very challenging, and may have required adjunctive techniques or materials because of the amount of advancement.<sup>[8]</sup> Despite any doubts regarding the negative effect of mandibular set back movement on posterior airway space, the mandible was positioned 3 mm backwards. Another concern was the posteriorly inclined narrow head of the condyle with low-adaptation capacity, which is typical of high mandibular plane angle cases and would need to adapt to the changes created by surgery.<sup>[9,10]</sup> Single-jaw surgery as a mandibular set-back was not an option since it would narrow the

**Table 1: Pretreatment, preoperative, posttreatment and 2-year posttreatment lateral cephalometric measurements of the patient**

Cephalometric measurements	Pretreatment	Preoperative	Posttreatment	2-year posttreatment
Go-Me-SN (°)	42	43	43	43
Sum of inner angles (°)	403	404	406	406
ANS-Me/N-Me ratio	82/143 (57)	84/144 (58)	85/144 (58)	85/144 (58)
Maxillary height (°)	67	68	61	61
Gonial ratio	56.5/92 (61)	55.5/93 (59)	55/94 (58)	55/94 (58)
FMA (°)	35	36	36	36
Y axis (°)	61	62	63	63
Occlusal plane/SN (°)	20	21	23	23
Palatal plane/SN (°)	9	9	11	11
SNA (°)	78.5	79	82.4	83
SNB (°)	85	84	79.9	80
ANB (°)	-6.5	-5	3.5	3
N per-P A (mm)	-6	-6	0	0
Maxillary depth (°)	86.5	87	90	90
I-SN (°)	101	99.5	102.5	102
I-palatal plane (°)	111	109	113	113
IMPA (°)	71	75	79	79
Holdaway ratio	1	1	1.2	1.2
Nasolabial angle (°)	90	90	94	94
Upper lip-E plane (mm)	-15	-15	-6.7	-6.7
Soft tissue convexity (°)	179	180	164	164

FMA=Frankfort mandibular-plane angle; IMPA=Incisor mandibular plane angle; SN=Plane between the anatomical points Sella and Nasion; SNA, SNB=Angle between SN and plane between Nasion-B point; ANB=Angle between the planes Nasion-A point and Nasion-B point

pharyngeal airway volume and negatively effect the esthetic components of the patient's profile.

## Conclusion

The treatment plan that was actually adopted was functional and realistic – and since the patient is happy with the esthetic and functional outcome, it is deemed successful.

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