

## Skeletal Class II with Open-Bite Malocclusion Treated with Orthodontics and Orthognathic Surgery

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### Abstract

Enhancing aesthetics, occlusion and functions is a primary motivation for individuals with open-bite malocclusion seeking orthodontic treatment. Open-bite malocclusion, characterized by a lack of vertical overlap of the anterior teeth, can be effectively treated with a combined surgical and orthodontic approach. In this case report, we present the treatment of a male patient with an open-bite malocclusion and a skeletal class II. Initially, the patient underwent a presurgical phase where fixed orthodontic appliance was bonded to achieve well-aligned arches, then came the maxillary impaction to normalize the overjet and overbite and enhance both aesthetics and functions. Keywords: Skeletal Class II, Open-Bite Malocclusion, Orthodontic Treatment, orthognathic surgery, Maxillary Impaction.

**Keywords:** Open-bite malocclusion, Orthodontic treatment, Orthognathic surgery, Maxillary impaction, Skeletal Class II.

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## INTRODUCTION

Dental and dentoalveolar open bite is the result of a mechanical blockage of the vertical development of the incisors and the alveolar component while skeletal relationships are normal, skeletal open bite is determined by a vertical discrepancy.

However, in most cases, the distinction is not clear since the malocclusion presents both dental and skeletal components [1]. The prevalence of anterior open bite ranges from 1.5% to 11% and varies between ethnic groups according to chronologic and dental ages [2]. Proffit *et al.*, recorded a prevalence of approximately 3.5% in patients from 8 to 17 years of age [2].

Etiology involves the interaction of environmental factors such as prolonged sucking habits, mouth breathing, tongue or lip thrusting, adenoid hypertrophy, syndromes, dental ankylosis, postural

mandibular imbalance and eruption disturbances with a genetically determined vertical facial grow pattern [1-3].

Although for some cases the intrusion of the maxillary posterior teeth using skeletal anchorage can provide satisfactory occlusal results, orthognathic surgery is the likely treatment option when an open-bite is associated with severe skeletal disharmony.

This case report presents the treatment of a class II malocclusion with skeletal sagittal and vertical discrepancies whose magnitude required an orthodontic-surgical treatment for reestablishment of normal and functional occlusion and adequate facial esthetics.

## PRESENTATION OF THE CASE

### Clinical Examination and Diagnosis

A male patient aged 33 years consulted with the Dento-Facial Orthopedics Department at the dental

medicine clinic of Monastir, Faculty of Dental Medicine, University of Monastir. His demands were both esthetical and functional. He had a chief complaint of his open-bite. No systemic or medical abnormalities were described.

The extraoral examination showed from the frontal view a symmetrical face with a parallelism at the horizontal lines of the face and a straight medial sagittal plane, an increase in the lower third of the face, the nasolabial sulcus is acute, and the labiomental fold is deep. When smiling, the open bite is clear. (Figure 1a and 1c).

The profile analysis showed a convex profile, an increased anterior facial height, and posterior facial divergence. He also presented a well-positioned upper lip but a retruded lower lip and a labio-mental fold in allonged S shape. The chin-neck line was narrow due to a retruded mandible and chin (Figure 1b).

The intraoral examination showed an unsatisfactory oral hygiene, an inflamed gingiva, with bleeding on probing. The upper dental arch was U shaped with a mild crowding in the incisal area and an interincisal diastema. The lower dental arch was U shape, exhibited a mild crowding in the incisal area, an interincisal diastema and presented a short lingual frenulum with macroglossia (Figure 1g and 1h).

Moreover, the occlusal examination revealed an Angle class II molar relationship on both sides associated with an Angle class II canine on both sides. The upper and lower incisors were proclined and the maxillary midline was deviated 2 mm towards the left of the midsagittal plane. The overjet was irregular from 2 to 3 mm with an open-bite reaching 8 mm in the anterior region (Figure 1d, 1e and 1f).

Furthermore, no symptoms or signs of any temporomandibular joint (TMJ) disorder were observed, maximal opening and lateral and anterior movements were within normal limits.

The functional examination revealed a mixed ventilation with a mouth breathing predominance, a dysfunctional swallowing and a disturbed phonation.

The analysis of plaster models showed a total dento-maxillary disharmony (DMD) of -21 mm according to Tweed's analysis and -7 mm according to Steiner's analysis.

The panoramic radiograph showed that all teeth were present with the third molars under development. There were no supernumerary teeth. The crown-root ratios were normal with good alveolar bone levels, no bone pathology and no root resorption. In addition, the mandibular condyles, nasal floor and maxillary sinuses appeared normal (Figure 2a).

The lateral cephalometric radiograph revealed a class II skeletal malocclusion (AoBo = 4mm) with a maxillary retrusion (SNA= 77°) and a mandibular retrusion (SNB = 73°) in relation to the anterior skull base. Additionally, a hyperdivergent vertical skeletal pattern was noted (GoGn/SN = 36° and FMA = 27°). Furthermore, the maxillary incisors presented increased axial inclination and were protruded in relation to their alveolar base (I/F=114°) same as the mandibular incisors (IMPA=110°) (Figure 2b).

#### Treatment Goals:

The treatment goals for this patient were as follows: (1) To obtain pure nasal breathing and functional swallowing. (2) To close the openbite. (3) To resolve the dental crowding in maxillary and mandibular arches. (4) To establish normal Class I canine and molar relationships with normal overjet and overbite. (5) To correct the inclination and position of the maxillary and mandibular anterior teeth. (6) To improve facial esthetics and smile.

#### Treatment Alternative:

The chosen treatment was: a combined orthodontic surgical approach without premolars extraction. The surgical approach would consist of maxillary advancement with differential impaction to improve the midface soft-tissue projection, completed with a postsurgical finishing phase.

#### Treatment Progress:

The treatment plan was carried out in three phases:

- Presurgical phase - Alignment and Decompensation.
- Surgical phase.
- Postsurgical phase – Finishing and settling.

#### \*Presurgical Phase (Figure 3)

After obtaining the patient's consent, bands and preadjusted 0.022\*0.028-in brackets were placed to the maxillary teeth. A 0.014-in nickel-titanium wire was engaged as the initial archwire to start leveling and aligning. Then .016 NiTi, .018 NiTi, and .017\*.025 NiTi were used successively. Open springs were used in mesial of the lateral incisors in order to open up the space for a later reconstruction of both laterals. Then a .018\*.025-in SS followed by 0.019\*0.025-in SS were placed in the maxillary arch to level the remaining curve of Spee.

The mandibular arch leveling started with the following sequence of archwires: 0.014", 0.016" then 0.018" NiTi. Gradually, rigid stainless steel archwires, 0.018, 0.017\*0.025", 0.018\*0.025", and 0.019\*0.025" were used with elastomeric chains to close the diastema.

At that phase, a surgical simulation was needed. Therefore, alginate impressions were done and a semi adjustable articulator was used to perform simulation. In sequence, surgical 0.019" x 0.025" stainless steel

archwires with welded hooks were installed and the patient was referred to orthognathic surgery, which was planned according to facial analysis, predictive cephalometric tracing, and preparation of the surgical guide.

#### \*Surgical Phase

At this stage, the surgical procedure, including maxillary advancement and differential impaction by a Lefort I osteotomy, under general anesthesia.

#### \*Postsurgical Phase

The patient returned for orthodontic finishing comprising closing minor diastemas, wearing intermaxillary elastics, performing wire artistic bends and Occlusal equilibration for the conclusion of the case. (figure 4)

Finally, after the active treatment phase, all appliances were removed, retention was performed with a bonded stainless steel lingual fixed retainer in both the maxillary and the mandibular arches and posttreatment

records were taken. (figure 5) Spaces were left open for a later reconstruction of both lateral incisors.

#### TREATMENT RESULTS:

All the predefined objectives were fulfilled: a significant improvement in the soft tissue profile indicated by the position of the upper lip, lower lip and the chin. The smile esthetics were significantly improved. (Figure 5: a-c) Intraorally, A class I bilateral angle canine and molar relation was achieved with good interdigitated occlusion, crowding was corrected, and an adequate Overjet and Overbite were achieved. The upper and lower dental midline coincidence was obtained (Figure 5: d-h). The post treatment cephalometric evaluation and superimposition confirmed a positive change in the profile. (Figure6) There was also a significant change in skeletal measurements in both sagittal and vertical dimension (Table 1). (Figure 5j)

Lastly, a panoramic radiograph shows satisfying root parallelism and good bone healing (Figure 5i).

**Table 1: Pretreatment, post myofunctional, and posttreatment cephalometric data**

Parameter	Average	Pre-treatment	Post-treatment
SNA (°)	82	77	83
SNB (°)	80	74	78
ANB (°)	2	3	5
AoBo (mm)	0	4	3
FMA (°)	25	27	23
GoGn/Sn (°)	32	36	30
FMIA (°)	68	44	56
I/i (°)	135	110	133
I/F (°)	107	114	105
IMPA (°)	90	111	101





Figure 1(a-h): Pre-Treatment Photographs

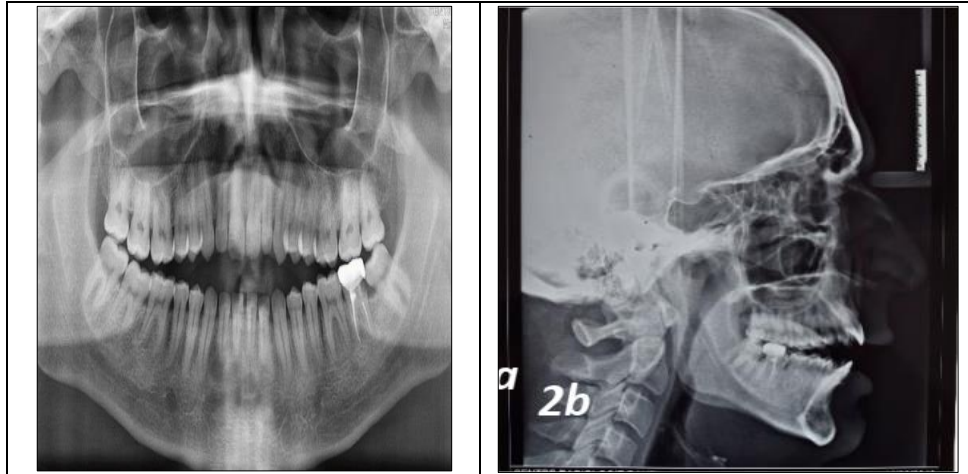


Figure 2 (a-b): Pre-treatment radiographs

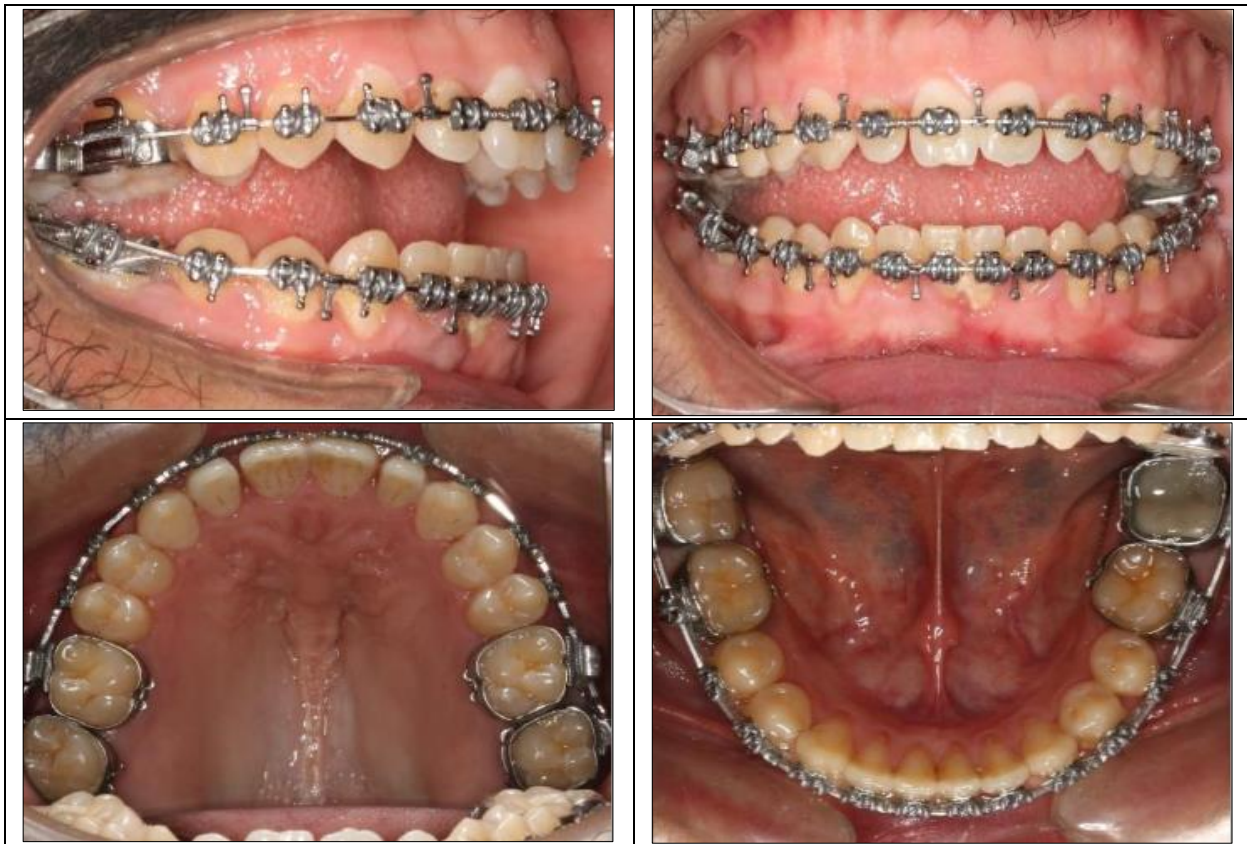


Figure 3: Presurgical phase

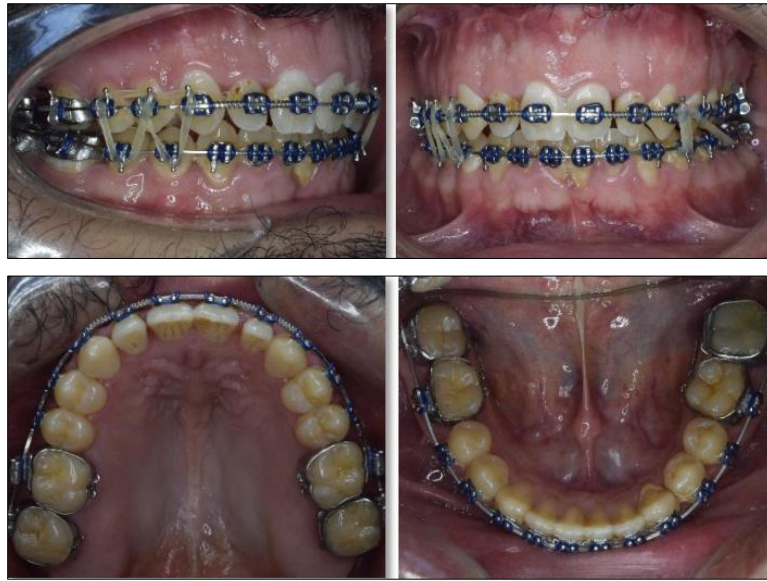


Figure 4: Postsurgical phase

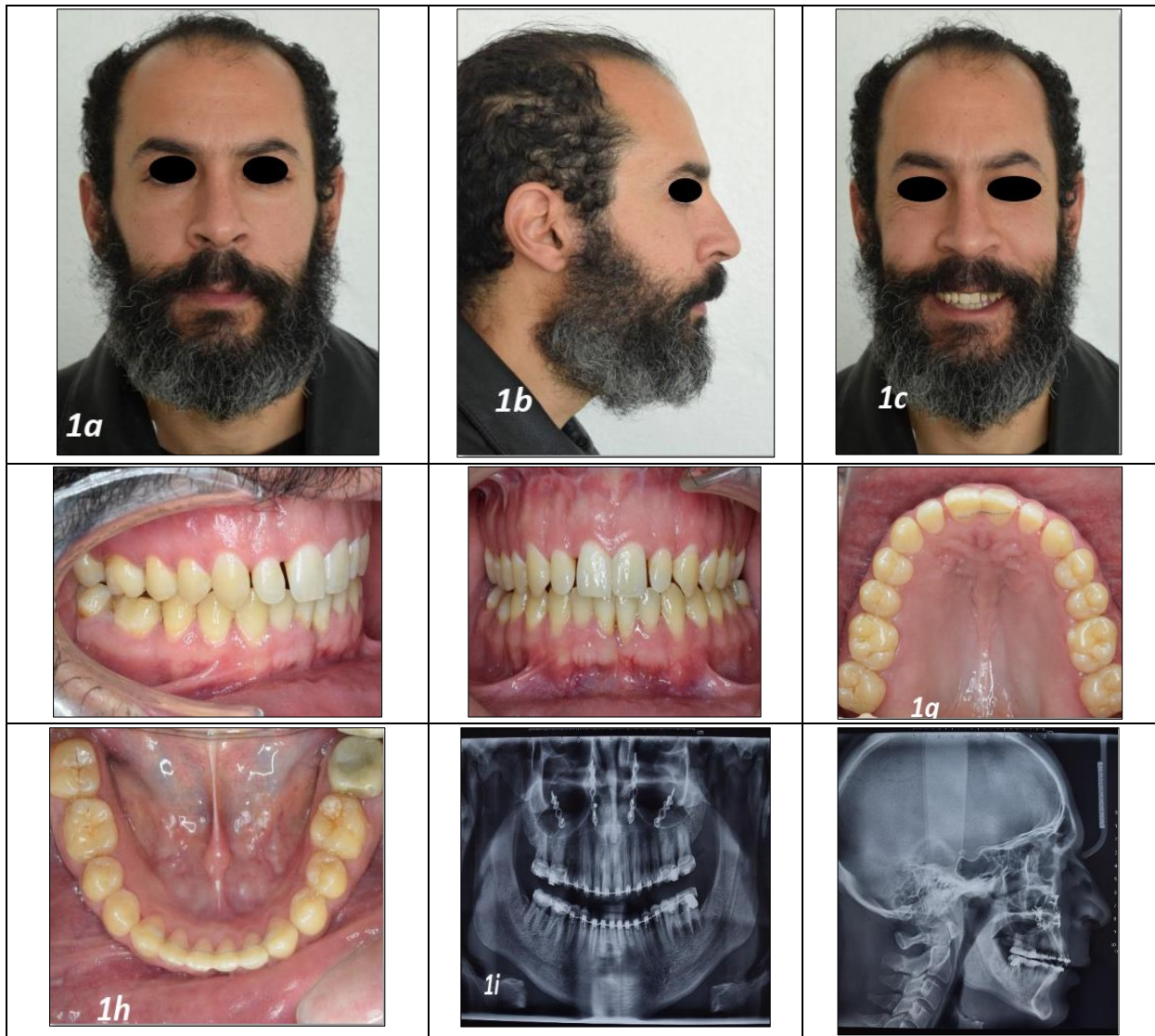
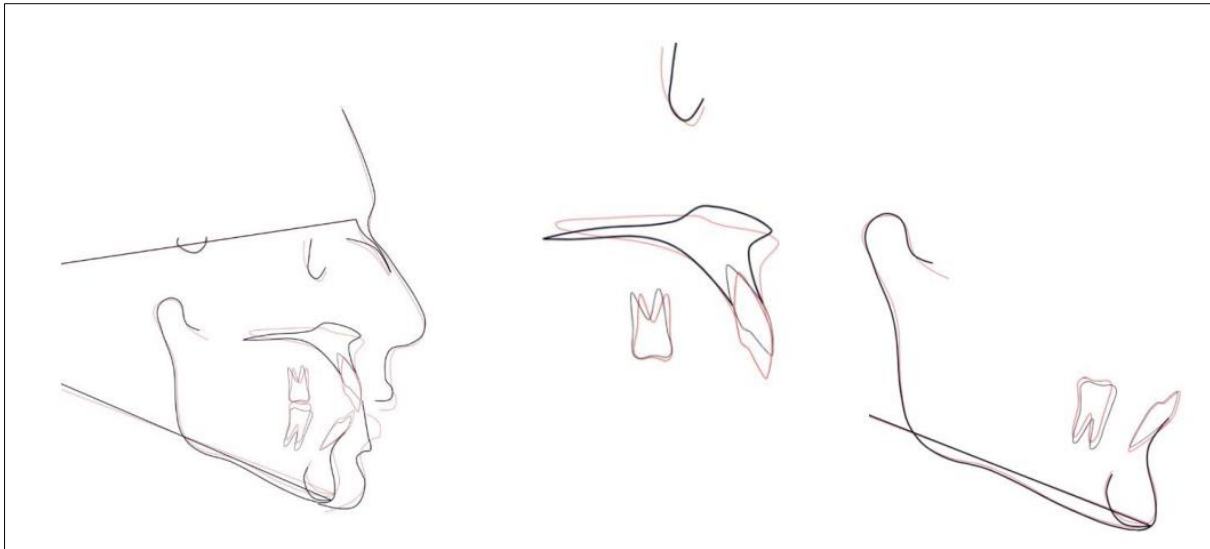


Figure 5: (a-j): Posttreatment photos and radiographs



**Figure 6: Total and partial cephalometric superimpositions: pretreatment (black) and posttreatment (red)**

## DISCUSSION

When a patient shows up for an initial consultation in the orthodontic office, and the clinician sees an open bite, most of the time a few red flags go up as this bite problem is challenging for most orthodontists. The open bite malocclusion is often difficult to treat successfully, and the long-term stability is frequently questionable [5].

Several alternatives have been proposed for the orthodontic non-surgical treatment of open bite, including intrusion or vertical control of posterior teeth [6-8], or extrusion of the anterior teeth [9]. However, in unfavorable skeletal patterns, an orthognathic surgery is suggested as the most appropriate approach [10, 11].

In the case presented in this report, the patient chief complaint was the open-bite resulting in a disturbed phonation and a significant psychosocial impact. This patient was 33 years old at the beginning of treatment. He came looking for a solution for his unaesthetic smile appearance.

He presented a class II skeletal malocclusion (AoBo = 4mm) with an open-bite that extended from right first molar to left first molar with a hyperdivergent vertical skeletal pattern (GoGn/SN = 36° and FMA = 27°).

In this case, the surgical approach was required. In fact, due to the massive open bite, relying solely on the orthodontic intrusion of posterior teeth and extrusion of anterior teeth will not be sufficient to ensure a functional overbite. A differential impaction was needed based on the vertical positioning of the maxillary incisors relative to the lip line and the increased anterior facial height and posterior facial divergence. Therefore, an orthodontic-surgical treatment was well indicated for this

case to manage skeletal malocclusion and to improve facial esthetics.

Finally, the treatment outcomes were very favorable, all objectives were fulfilled: there was significant improvement in facial profile and esthetics with adequate maxillary impaction to sufficiently show the maxillary incisors relative to the upper lip and improve smile esthetics, in addition to the obtention of functional and balanced occlusion (establishing normal Class I canine and molar relationships with normal overjet and overbite by the autorotation of the mandible).

## CONCLUSION

Open-bite malocclusion is a great challenge for orthodontists: a detailed diagnosis with a rigorous analysis of the occlusal, skeletal and soft tissue components has to be performed. Also, a correct planning as well as an adequate execution of the treatment plan are determinant factors for a successful result and long-term stability. In the case described, achieving planned treatment goals was challenging. The management of the open-bite malocclusion was shown successfully. To fulfill the treatment objectives, combined surgical and orthodontic treatment were suggested. Indeed, good facial esthetics, functional and occlusal results were achieved. However, the maintenance of stable results is thus influenced by muscle adaptation, functional swallowing, the establishment of a good interincisal angle, and a good interdigitation of the occlusion [12].

Declaration of Patient Consent: The authors certify that they have obtained all appropriate patient consent.

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