

Nonsurgical Correction of an Adult Skeletal Class III and Open-bite Malocclusion

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Abstract: This case report presents an adult skeletal Class III and open-bite malocclusion case treated without surgical intervention using fixed edgewise technique, reverse headgear, and Class III and anterior box elastics. The patient was a 16-year-old Turkish female who had completed her growth and development. She had a four mm open bite, maxillary retrognathia, a crossbite in the anterior and left posterior, and hypoplasia of the maxillary laterals. In addition, the patient's first molars had previously been extracted because of caries, and extraction spaces were present. We applied a Roth edgewise appliance and a reverse headgear to be used at night only for the first six months. The objective in using a reverse headgear was to displace the maxillary teeth toward the mesial and to rotate the maxilla in a clockwise direction. In the mandible, we retracted the mandibular incisors and canine teeth and moved the second molars mesially toward the first molar extraction space. There would thus be no need for any prosthetic restoration in the mandible. At the end of treatment, we obtained a Class I dental relationship, an ideal occlusion relationship, and an esthetic dental and facial relationship. Treatment of the patient was completed in 20 months. (*Angle Orthod* 2006;76:527–532.)

Key Words: Adult open bite; Nonsurgical treatment; Skeletal Class III

INTRODUCTION

Edward H. Angle described Class III malocclusion as one in which the lower first molar is positioned mesially relative to the upper first molar.¹ This relationship may result from a normal maxilla and mandibular skeletal protrusion or a maxillary retrusion and a normal mandible or a combination of maxillary retrusion and mandibular protrusion. A Class III dental relationship could also exist in a patient with a normal maxillomandibular relationship. Patients with a Class III malocclusion usually have a concave facial profile, and the lower lip often is protruded relative to the upper lip.

Sometimes a Class III relationship is caused by a forward shift of the mandible to avoid incisal interferences. This is a pseudo Class III malocclusion.² The

influence of environmental factors and oral function on the etiologic factors of a Class III malocclusion is not understood completely.³ In the United States, true skeletal Class III malocclusions are found in less than 1% of the general population.^{4,5} Most US orthodontists therefore treat fewer patients with Class III malocclusions than with Class I or II malocclusions. For many Class III malocclusions, surgical treatment is the best alternative. Depending on the amount of skeletal discrepancy, surgical correction may consist of mandibular retraction, maxillary protraction, or a combination of mandibular and maxillary procedures.

Skeletal open bite is a complex and multifactorial anomaly. In such individuals, the dimensions in the facial perpendicular direction are also increased.⁶ There are many reasons for the occurrence of open bite, including abnormal growth pattern, finger-sucking, airway obstruction, and tongue posture and function.⁷ Cases of open bite are a rather complex and difficult anomaly.

The morphological indications of open bite include a steep mandibular plane and increased anterior facial height, both of which reflect mainly downward and backward rotation of the mandible and vertical overgrowth of the maxilla.⁸ In most adult open-bite cases that show neither severe skeletal problems nor remarkable facial disharmony, nonsurgical treatment usually has been indicated.

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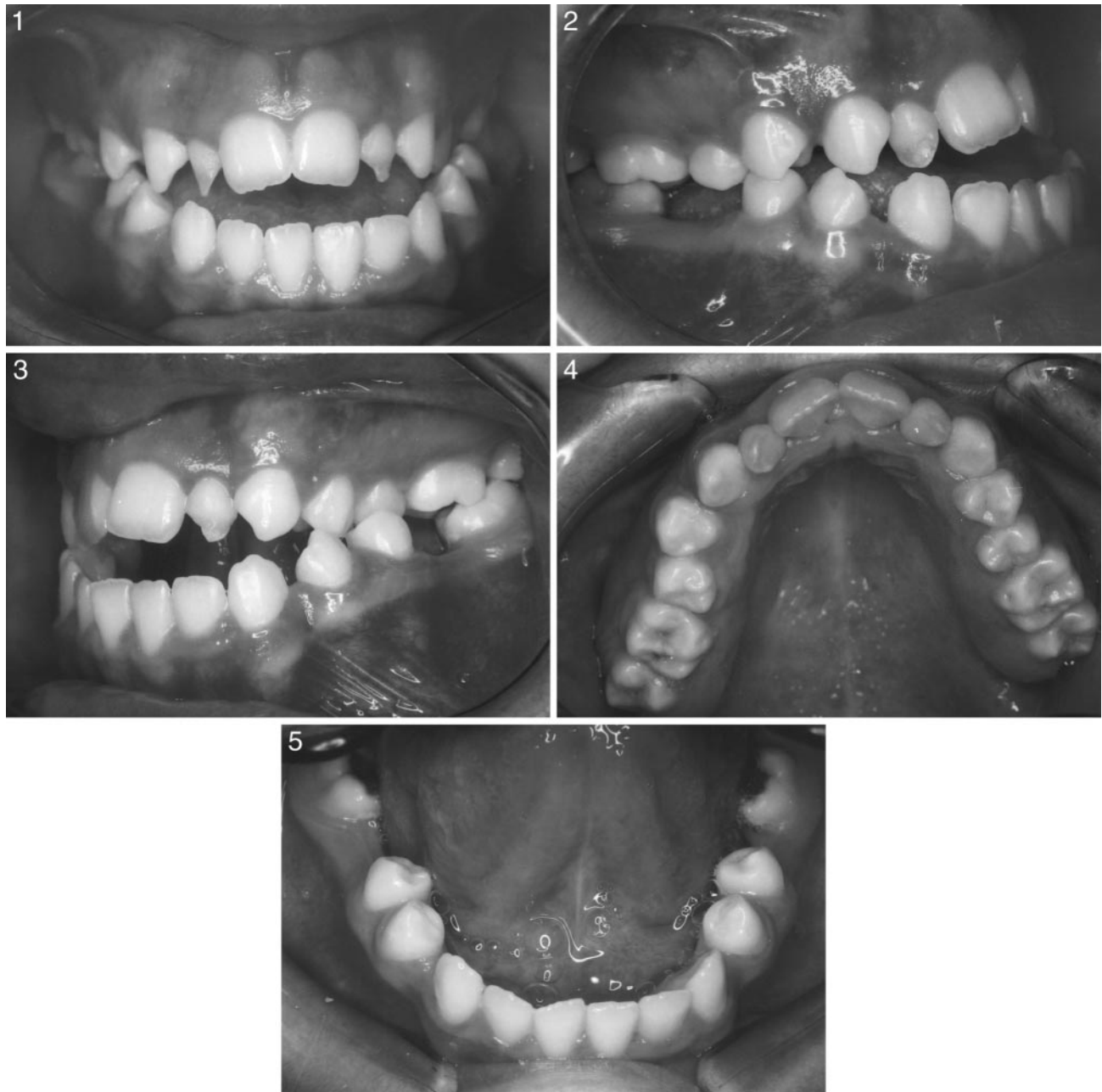
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FIGURES 1–10. Pretreatment intraoral and extraoral photographs and radiographs.

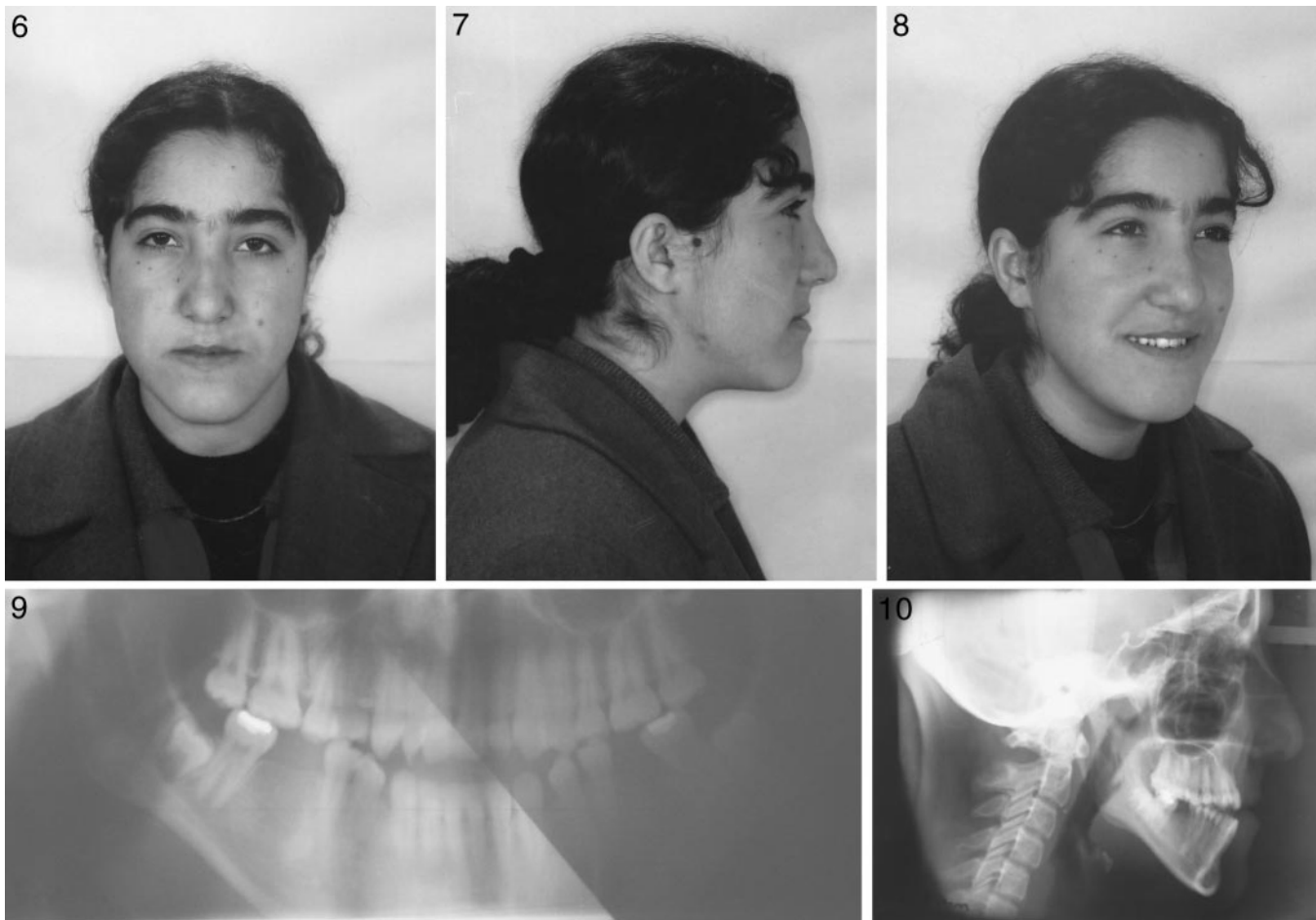
Studies of the long-term stability of open-bite correction after orthodontic treatment have reported that 35% of the patients have significant relapse of the open bite.⁹ Therefore, the causative factors in individual cases should be determined as clearly as possible at diagnosis and suitable treatment mechanics should be chosen for efficient treatment and long-term stability.

CASE REPORT

The patient was a 16-year-old female, whose chief complaints were functional ones such as failure of the

anterior teeth to make proper contact as well as her esthetic appearance. The patient stated that this appearance had persisted since middle school. During anamnesis, the patient stated that she had no parafunctional habits, that there was no family history of such an appearance, and no ENT problem. No TMJ problem was encountered during the clinical examination, and the patient's tongue dimensions were normal.

Intraoral examination revealed that the midline had deviated three mm to the left in the mandible as well as a four mm open bite. In addition there was a cross-



FIGURES 1–10. Continued.

bite in the anterior and left posterior region. In addition, there were hypoplastic and shape anomalies in the maxillary lateral incisors and diastemata in the mandible. Moreover, the patient's mandibular first molar teeth had previously been extracted because of caries and extraction spaces were present (Figures 1–8).

The lateral cephalometric analysis revealed a skeletal Class III and open-bite anomaly with an ANB angle of -1° and a SN-GoGn angle 42° . At soft tissue analysis, the distance from the upper lip to the S line was -7 mm and that of the lower lip as -3 mm. The BaPtmGn angle was 80° , showing that the mandible was rotated toward the posterior. Total anterior facial height (Na-Me) was 137 mm, posterior facial height (S-Go) was 85 mm, and the S-Go/N-Me ratio was 62%, showing a skeletal open-bite inclination (Figures 9–10).

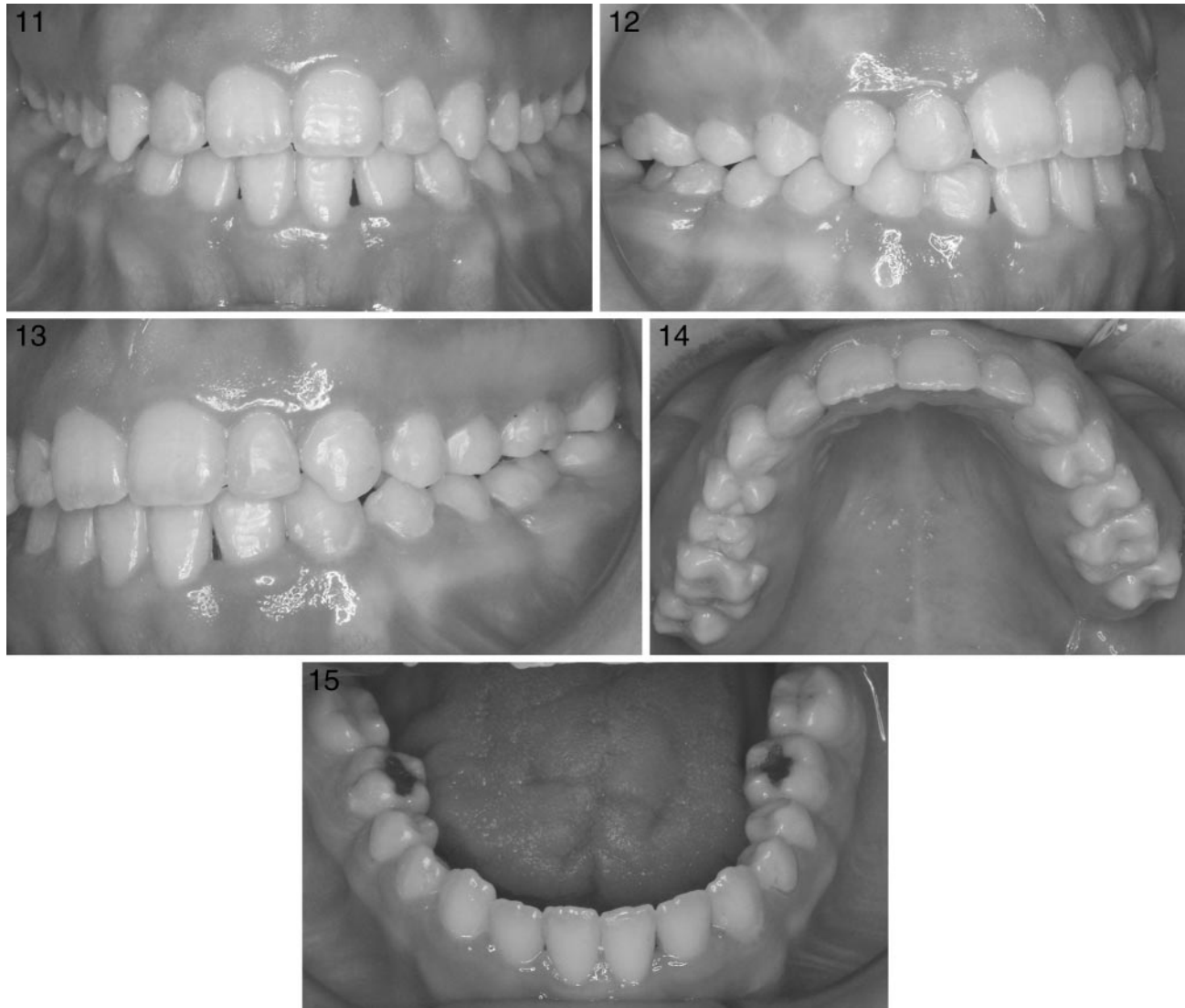
TREATMENT OBJECTIVES

Our treatment objectives were: (1) correction of the anterior open bite and crossbite and the provision of an ideal overjet and overbite relationship, (2) correc-

tion of the occlusal relationships and the goal of a dental Class I relationship, (3) correction of the occlusal plane inclination and rotation of the mandible toward the anterior, (4) closure of the diastemata in the mandible and the first molar extraction spaces and to avoid any restoration being required in the lower jaw, (5) correction of the midline, and (6) to proper size and function teeth having hypoplastic and form anomalies at the end of orthodontic treatment. In short, our objective was to provide the patient with an acceptable occlusal relationship and an esthetic facial appearance.

TREATMENT PROGRESS

The treatment plan was explained to the patient and began once she gave consent. At the first session, a 0.018×0.022 -inch Roth edgewise appliance was placed on the upper and lower teeth and 0.014 inch NiTi arch wires were placed for one month of leveling. At the second session, 0.016×0.022 -inch steel arch wires were placed and a reverse headgear applied in



FIGURES 11–20. Posttreatment intraoral and extraoral photographs and radiographs.

such a way as to pass between the canine and lateral incisors from 30° below the occlusal plane and provide a unilateral 350 g force. A reverse headgear was applied only at night for approximately 10 hours a day for six months.

The objective of our reverse headgear was to bring the maxillary teeth forward, correct the crossbite, and also to assist closing of the open bite by a clockwise rotation to the maxillary dental arch. In order not to increase the inclination of the maxillary incisors, labial root torque was applied to the maxillary incisors before the application of the reverse headgear. In the mandible, we began to retract the incisors and canines toward the distal with chain elastics and Class III intermaxillary elastics. After the reverse headgear had been used for six months, sufficient overjet was achieved and a clockwise rotation was achieved in the

maxillary dental arch. After the reverse headgear, box elastics were applied in the anterior region to establish overbite.

Once an ideal overjet and overbite relationship had been established in the anterior region, the second molars were moved to the mesial both to close the bite and to permit the mandible to rotate in an anterior direction, to eliminate the need for any restoration, and for the third molar occlusion. In moving the mandibular molars to the mesial, chain elastics were used from both the buccal and lingual to obtain as parallel a movement as possible. The patient displayed good motivation both in the use of elastics and the reverse headgear. After treatment, upper and lower Hawley retainers were made and planned in such a way as to be used constantly for one year and then at night only (Figures 11–20).



FIGURES 11–20. Continued.

TABLE 1. Pre-post Treatment Cephalometric Analysis

	Pretreatment	Posttreatment
SNA (°)	76	76.5
SNB (°)	77	77
ANB (°)	-1.5	-1
SND (°)	76	76
1-NA (°)	6	5
1-NA (mm)	29	26
I-NB (°)	4	2
I-NB (mm)	24	15
Pg-NB (mm)	3	3
(I-NB)-(NB-Pg) (mm)	2	-1
1-I (°)	128	140
Occlusal-SN (°)	18	16
GoGn-SN (°)	42	41
SL (mm)	36	36
SE (mm)	26	26
Soft tissue	-7/-3	-5/-3
BaPtmGn (°)	80	84
ANS-Me (mm)	75	75
N-Me (mm)	137	137
Ar-Go (mm)	59	59
Co-A (mm)	86	86
Co-Gn (mm)	125	125

RESULTS

After 20 months of active treatment, the edgewise appliance was removed. The anterior open bite and crossbite were entirely corrected and a dental Class I relationship established. A 0.5° improvement occurred in the ANB angle. An anterior rotation was applied to the mandible, and a 4° increase occurred in the Ba-PtmGn angle. In addition, a 2° decrease occurred in the occlusal plane-SN angle. The dental midline was corrected and brought to coincide with the facial midline. The lower second molar teeth were moved parallel to the first molar extraction spaces, and the third molars were in occlusion. The form and shape of the maxillary lateral teeth were established with composite laminate restoration. A functional and acceptable occlusal relationship was established. Despite our use of reverse headgear, a 3° reduction in upper incisor inclination occurred (Table 1).

DISCUSSION

With the Roth edgewise appliance, protraction face-mask, and Class III elastics, we aimed to correct both

the occlusal relationship and the facial esthetic, and we achieved all our aims. At the end of treatment, we obtained a Class I relationship in the canines and molars and a functional occlusal relationship.

By using a protraction facemask, we aimed to bring about an anterior movement in the maxillary teeth and a clockwise rotation in the maxilla. When young (age 4–10 years) and mature (age 10–15 years) individuals were compared in one study, the effect of reverse headgear was less pronounced in mature individuals, but similar effects did occur.¹⁰ Anterior movement in maxillary sutures and histological changes in circumaxillary sutures have been observed in many animal studies.^{11,12}

Our aim in using a reverse headgear was to achieve more dental effects, ie, to bring the teeth toward the mesial and effect a clockwise rotation. We applied the reverse headgear from 30° below the occlusal plane to ensure clockwise rotation. Because our patient was an adult, the reverse headgear we used caused more of a dental effect, with only a 0.5° increase in S-angle.

In traditional open-bite treatment, a headgear is used to prevent vertical maxillary growth, a chin cup to prevent vertical growth the mandible, or vertical elastic for incisor extrusion in the anterior region. Other methods are a crib apparatus used for the purpose of treatment or reinforcement, posterior bite blocks, posterior magnets, or a functional apparatus.^{7,13} Because our patient was an adult skeletal open-bite case, we used vertical box elastics for incisor extrusion. In the treatment of individuals with severe open bite or excessively increased facial height, orthodontic and orthognathic treatment is recommended.⁷

If the use of reverse headgear is required in cases with a tendency to hyperdivergence, then in order not to open the bite to excess, the force effect line must be applied from or from a little above the upper dental arch center of resistance, ie, approximately 30–45° downward at the level of the hooks installed between the canines and lateral incisors. In this manner, the

upper dental arch moves forward and downward, with a clockwise rotation.⁶ For that reason, we applied a reverse headgear from approximately 30° below the occlusal plane.

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