

CLINICAL
SECTIONNon-surgical treatment of Class III
malocclusion in adults: two case reports**Ibrahim Erhan Gelgör**

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Class III malocclusions are usually growth-related discrepancies, which often become more severe until growth is complete. The surgery can be part of the treatment plan. The purpose of this report is to review the orthodontic treatment of two patients with a Class III malocclusion who were treated non-surgically. The basis for this treatment approach is presented and the final treatment result reviewed. Important factors to consider when establishing a Class III molar relationship are discussed.

Key words: Skeletal Class III, adults, non-surgical treatment

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Introduction

The Skeletal Class III malocclusion is characterized by mandibular prognathism, maxillary deficiency or both.^{1–3} Clinically, these patients exhibit a concave facial profile, a retrusive nasomaxillary area and a prominent lower third of the face. The lower lip is often protruded relative to the upper lip. The upper arch is usually narrower than the lower, and the overjet and overbite can range from reduced to reverse.⁴

The effect of environmental factors and oral function on the etiological factors of a Class III malocclusion is not completely understood. However, there is a definite familial and racial tendency to mandibular prognathism.^{5,6} For many Class III malocclusions, surgical treatment can be the best alternative. Depending on the amount of skeletal discrepancy, surgical correction may consist of mandibular setback, maxillary advancement or a combination of mandibular and maxillary procedures. After surgical correction of the skeletal discrepancy, the occlusion is usually finished orthodontically to a Class I relationship. However, if surgical treatment is not performed, and the final molar relationship is Class III or Class I, there are challenges specific to the static and functional Class III occlusion that must be considered.⁷ 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. In these cases, it is important to establish the inter-occlusal relationship with the teeth in the retruded contact position.⁸

In this paper, the non-surgical orthodontic treatment of two patients with a Class III malocclusion is discussed and the use of compensation mechanics is illustrated.

Case 1*Patient history*

A 25-year-old male presented with a moderate dental and skeletal Class III malocclusion. The patient's profile was concave (Figure 1). The lower lip was prominent and the lips were incompetent with no mentalis strain. Vertical facial proportions were normal and there were no significant asymmetries.

A full complement of permanent teeth was present (only one upper third molar being absent). The large cavities in right and left lower second molars were treated with amalgam and composite restorations respectively before the orthodontic treatment. (Figures 2 and 3). In both centric occlusion (CO) and centric relation (CR) molar and canine relationships were Class III, and the incisors had an anterior crossbite with a negative overjet of 3 mm. The curve of Spee was moderate with a 2.5 mm overbite in both CO and CR. Both the maxillary and the mandibular arches exhibited moderate arch length discrepancies. No tooth size or CO–CR discrepancies were noted. Oral hygiene was moderate.

The pre-treatment cephalometric evaluation (Figure 4 and Table 1) showed that: the maxilla was slightly

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Figure 1 Pre-treatment extra-oral photographs of Case 1



Figure 2 Pre-treatment intra-oral photographs

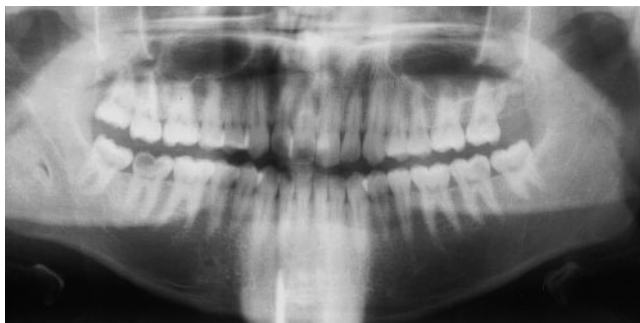


Figure 3 Pre-treatment panoramic radiograph



Figure 4 Pre-treatment cephalometric radiograph



Figure 5 Post-treatment extra-oral photographs

retrusive to the cranial base (SNA 81°), and in CO the mandible was in a normal position relative to the cranial base and maxilla (SNB 82°). The ANB (-1°) indicated a Class III skeletal relationship. The maxillary incisors were slightly upright, while the mandibular incisors were somewhat protrusive. The mandibular plane was normal relative to the cranial base (SN–MeGo 31°).

Treatment objectives

1. To establish Class I canine relationships;
2. to eliminate maxillary and mandibular arch length discrepancies;
3. to align arches;
4. to correct overbite, overjet and midlines;
5. to provide an aesthetic smile.

The following treatment plan was established. Maxillary and mandibular fixed appliances (standard edgewise 0.022-inch) were used. After initial leveling and alignment with round wires in both arches, a 0.016 × 0.022-inch ss utility arch was used for protrusion of the upper

incisors. For retraction of the mandibular incisors a 0.016 × 0.022-inch continuous arch and Class III elastics were used. Fixed appliance treatment was completed in 22 months.

Treatment results

The treatment plan was a satisfactory non-surgical alternative, and the treatment objectives were achieved (Figures 5–9 and Table 1). A Class I canine relationship was established with good alignment. Some occlusal adjustment was needed to finalize the occlusion. A positive overjet was established and the overbite was somewhat reduced. Tooth position was controlled while the mandibular incisors were retracted resulting in improved incisor inclination after treatment. The maxillary incisors were proclined significantly resulting in better upper lip prominence and an improved facial profile. Correction of the malocclusion was accomplished with dentoalveolar changes only. Skeletally, the mandible was still prognathic and the chin was slightly prominent.



Figure 6 Post-treatment intra-oral photographs

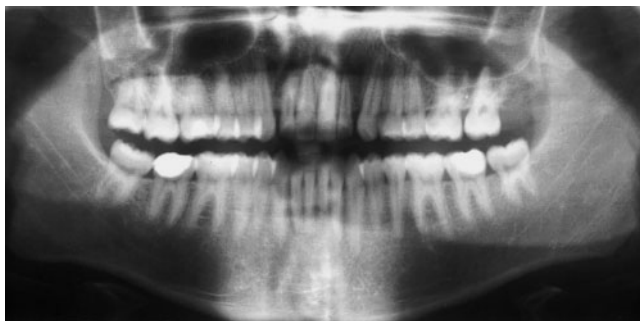


Figure 7 Post-treatment panoramic radiograph

Secondary treatment

On completion of active treatment, further occlusal adjustment was performed. Composite buildups were added to both the upper right and left lateral incisors and canine teeth to close the diastemas, and maxillary and mandibular fixed retainers were also inserted.

Case 2

Patient history

A 36-year-old male presented with a moderate dental and skeletal Class III malocclusion. The patient's profile was concave in both CO and CR (Figure 10). The lower lip was prominent. Vertical facial proportions were normal, and there were no significant asymmetries.

A full complement of permanent teeth was present except for the upper third molars and left lower second premolar, which were absent (Figures 11a,b and 12). In CO, molar and canine relationships were Class III and the incisors were in anterior crossbite with an overjet of



Figure 8 Post-treatment lateral cephalometric radiograph

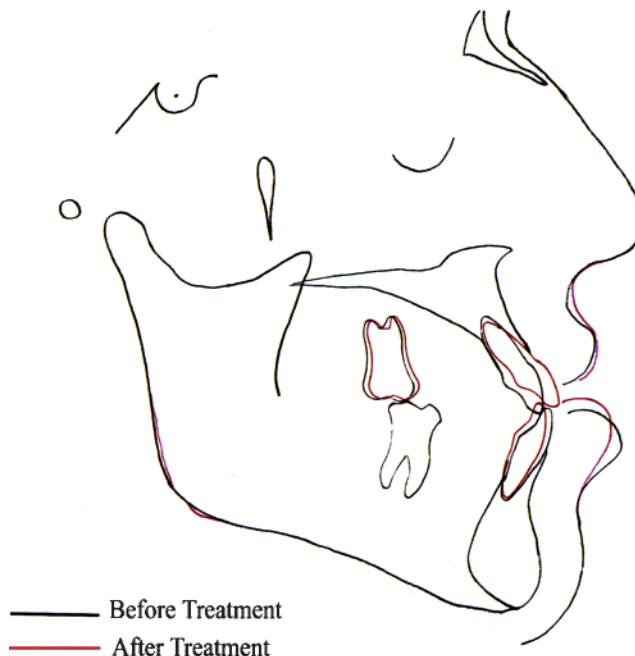


Figure 9 Superimposition (on the SN plane and registering on sella) of lateral cephalometric radiographs before and after treatment

–3 mm. In CR the incisors were in an end-to-end relationship. The curve of Spee was moderate with a 3 mm overbite in CO. Both the maxillary and the mandibular arches exhibited moderate arch length discrepancies. There were diastemas in the lower incisor region. Oral hygiene was good.

The pre-treatment cephalometric evaluation (Figure 13 and Table 2) showed that the maxilla was retrusive relative to the cranial base (SNA 78°), and in CO the mandible was in a normal position relative to the cranial

Table 1 Cephalometric evaluation of the changes before and after treatment for Case 1

	Before	After	Change
SNA	81°	80°	–1°
SNB	82°	82°	0°
ANB	–1°	–2°	–1°
SN/ANS-PNS	5.5°	5.5°	0°
SN/MeGo	31°	31°	0°
SNGn	119°	119°	0°
Mx1/NA	20°	25°	5°
ANS-PNS/U1	110°	114°	4°
Md1/NB	25°	23°	–2°
IMPA	93°	90°	–3°
Overjet(mm)	–2.5	2	4.5
Overbite(mm)	3	2	1

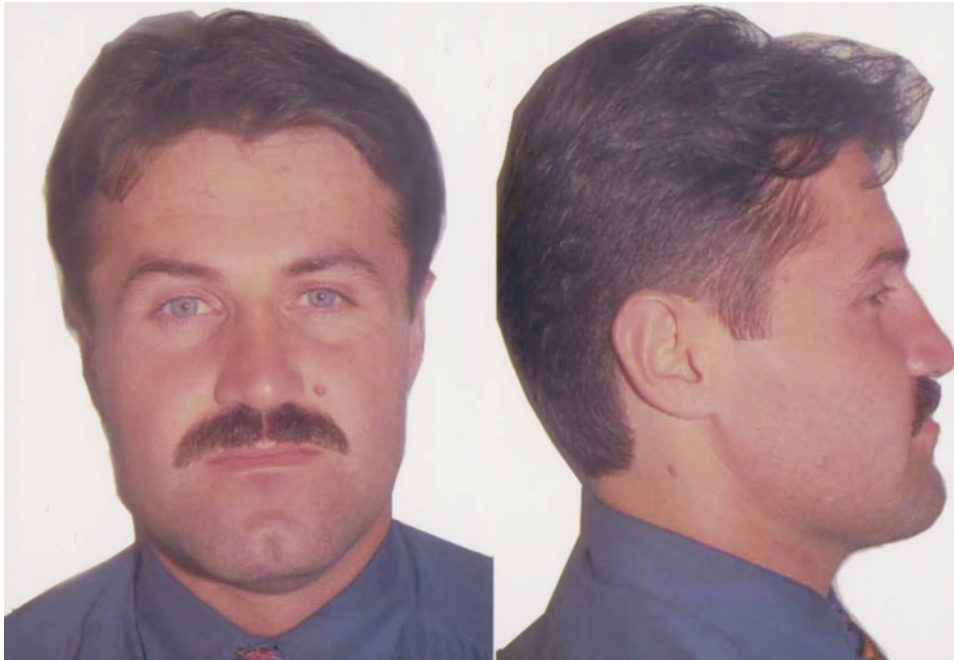


Figure 10 Pre-treatment extra-oral photographs of Case 2

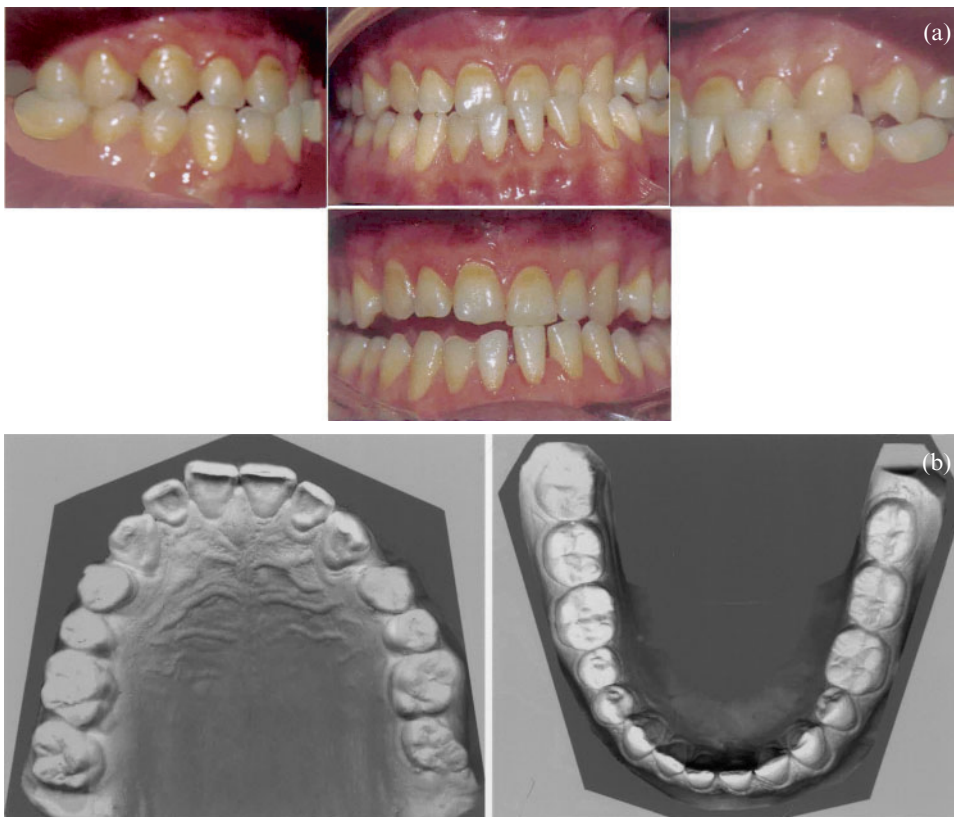


Figure 11 (a,b) Pre-treatment intra-oral photographs

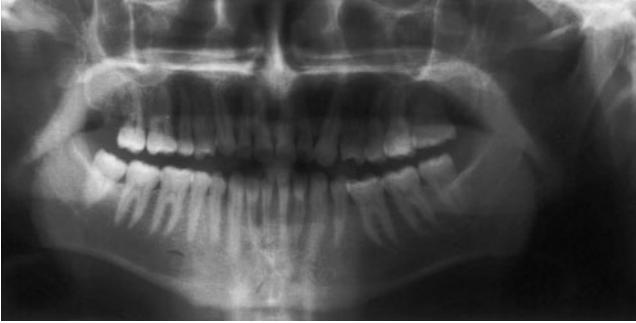


Figure 12 Pre-treatment panoramic radiograph

base and maxilla (SNB 82°). The ANB (-4°) indicated a Class III skeletal relationship. The maxillary incisors were slightly upright, while the mandibular incisors were somewhat protrusive. The mandibular plane was normal relative to the cranial base (SN–MeGo 30°).

Treatment objectives

1. To eliminate the CR-CO discrepancy and anterior crossbite;
2. to establish Class I canine relationships;
3. to eliminate maxillary and mandibular arch length discrepancies;
4. to align the arches;
5. to correct the overbite, overjet and midlines;
6. to provide an aesthetic smile.

The following treatment plan was developed. Maxillary and mandibular fixed appliances (standard edgewise 0.022-inch) were used. After initial leveling and alignment with round arch wires in both the upper and lower dental arches, a 0.016 × 0.022-inch ss utility arch was used for protrusion of the upper incisors. For retrusion of the mandibular incisors power chain, from canine to canine was applied on a 0.016 × 0.022-inch continuous arch combined with Class III elastics. Class III elastics allowed the upper spacing to be closed from behind. Fixed appliance treatment was completed in 26 months.

Treatment results

The treatment plan was a satisfactory non-surgical alternative, and the treatment objectives were achieved (Figures 14–18, and Table 2). Class I canine relationships were established with good alignment of the teeth. Some occlusal adjustment was needed to finalize the occlusion. A positive overjet was established and the overbite was somewhat reduced. Good torque control was maintained while the mandibular incisors were



Figure 13 Pre-treatment cephalometric radiograph

retracted resulting in better incisal inclination after treatment. The maxillary incisors were proclined significantly resulting in better upper lip prominence and an improved facial profile. Correction of the malocclusion was accomplished with dental movement. Skeletally, the mandible was still prognathic, and the chin was slightly prominent.

Secondary treatment

On completion of active treatment, further occlusal adjustment was performed: composite build ups were performed on both upper right and left lateral incisors and the canine teeth to close the diastemas between them, and maxillary and mandibular fixed retainers were inserted.

Discussion

The surgical correction of Class III malocclusion can be undertaken in a variety of ways, e.g. a bilateral sagittal split osteotomy to retract the mandible or a Le Fort I procedure to advance the maxilla, or a combination of these. However, the associated surgical risks and complications must be considered, as well as the increased expense.⁷ If a non-surgical treatment alternative can produce results comparable with those that could be achieved surgically, then it should be considered and can be the treatment of choice for some patients.

In the two patients presented there was a significant skeletal discrepancy, but the presence of protrusive mandibular and retrusive maxillary incisors, and a functional shift with an end-to-end incisor relationship in case 2 in CR made non-surgical treatment a viable option. The inclination of the incisors can determine



Figure 14 Post-treatment extra-oral photographs

whether an anterior crossbite can be successfully treated without surgery. Palatally inclined maxillary incisors can be moved labially and labially inclined mandibular incisors can be moved lingually—even to overcorrected positions—to establish a normal overjet.¹ It was believed that acceptable facial profiles and functional occlusions could be achieved by treating these patients with protrusion of upper incisors and retrusion of lower incisors using fixed appliances without the need for orthognathic surgery. At the end of treatment, the chins of both the patients were slightly prominent, but there was no need for genioplasty.

Class III elastics were used after initial leveling and alignment with round arch wires in both arches to retract the lower incisors and aid maxillary posterior anchorage during protrusion of the upper incisors. The retraction of the lower incisors allowed for the establishment of a Class I canine relationship. The molars were left in a Class III relationship.

The utility arch was very useful to protrude the upper incisors. If necessary a utility can be used to extrude the incisors.

In a Class I molar relationship the mandibular first molar normally occludes with the maxillary second premolar and first molar. In a Class III relationship the mandibular first molar occludes with the maxillary first and second premolars. The occlusal anatomy of these teeth can prevent good contact and interdigitation. Occlusal adjustment during and after treatment can improve the occlusion. The most prominent interference comes from the buccal of the mandibular molars occluding with the lingual inclines of the buccal cusps of the premolars. To eliminate this problem, a combination of tooth positioning and enamel re-contouring is used. The mandibular molars should be positioned more to the lingual than in a Class I relationship, and the maxillary posterior teeth are positioned more to the buccal. Enamel re-contouring usually involves the



Figure 15 Post-treatment intra-oral photographs

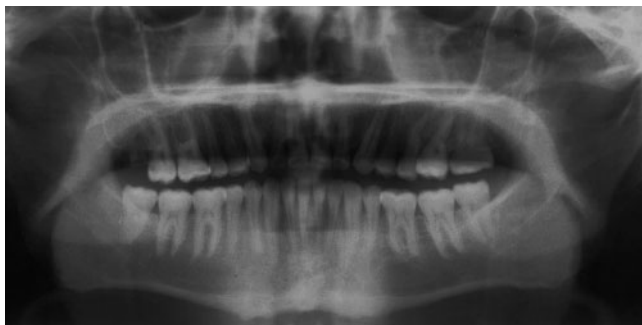


Figure 16 Post-treatment panoramic radiograph

buccal of the mandibular molars and the lingual ridges of the buccal cusps of the maxillary premolars and first molar. Specific re-contouring depends on the tooth anatomy of each individual patient. Although some may not consider this an ideal occlusion, balanced tooth contact can be obtained in a Class III relationship.⁷

The functional excursions are not usually a problem because Class I canines and good overbite/overjet relations are established. Incisal and canine guidance can be achieved. Group function in lateral excursions can also be achieved but is more difficult because of the molar/premolar occlusion.

In addition to retraction of the mandibular anteriors, some proclination of the maxillary incisors is usually required to establish good overjet relations. This proclination can also add prominence to the upper lip, and produce a better aesthetic relationship between the upper and lower lips. A sufficient overbite can actually help retain the correction of an anterior crossbite. If such a patient has zero or a negative overbite, the incisors will be prone to relapse after being moved into position.

In Skeletal Class III malocclusion, while a positive overjet is established with protrusion of the upper



Figure 17 Post-treatment lateral cephalometric radiograph

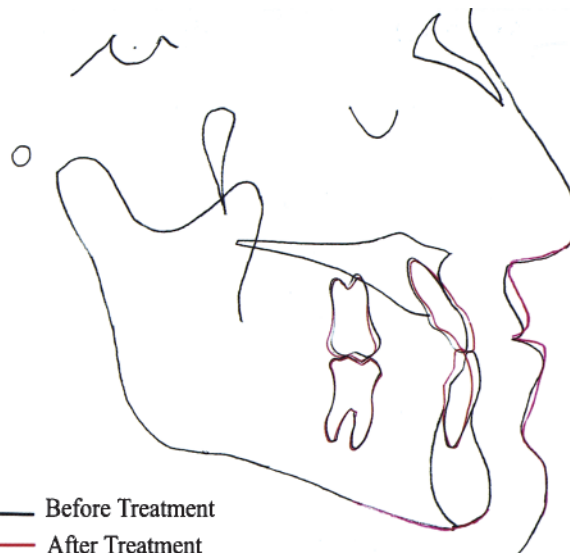


Figure 18 Superimposition (on the SN plane and registering on sella) of lateral cephalometric radiographs before and after treatment

incisors, generally a diastema appears between the upper lateral incisors and canines. If there is an anterior tooth size discrepancy, the diastema can be solved with interproximal reduction of the mandibular anterior teeth and their continued retraction, and the further retraction of the maxillary anterior segment. If there is no tooth size discrepancy, composite build-ups can be performed to both upper lateral incisors and canines. In Case 1, no enamel reduction could be undertaken in the lower arch because there was no anterior tooth size discrepancy. The health of the periodontium should always be considered in developing a treatment plan. Proclination of the maxillary incisors may be dependent on gingival health and contour in that area and must also be considered before deciding on this treatment choice.

Table 2 Cephalometric evaluation of the changes before and after treatment for Case 2

	Before	After	Change
SNA	78°	77°	-1°
SNB	82°	82°	0°
ANB	-4°	-5°	-1°
SN/ANS-PNS	7°	7°	0°
SN/MeGo	30°	30°	0°
SNGn	120°	120°	0°
Mx1/NA	22°	24°	2°
ANS-PNS/U1	111°	115°	4°
Md1/NB	26°	24°	-2°
IMPA	92°	89°	-3°
Overjet(mm)	-3	2	5
Overbite(mm)	3	2	1

This paper presents the non-surgical orthodontic treatment of two adult patients presenting with Class III malocclusions. Treatment was undertaken using a combination of compensation mechanics and fixed orthodontic appliance treatment only and suggests that in some, carefully selected cases, this approach can be a viable treatment option.

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