

# Unilateral maxillary molar distalization using zygoma-gear appliance

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## ABSTRACT

The aim of the present case report was to present the treatment of a patient with Class II subdivision using the zygoma-gear appliance (ZGA) for unilateral maxillary molar distalization and fixed appliances for the further treatment needs. The ZGA consisted of a miniplate, an inner bow and a sentalloy closed coil spring. Three weeks after the miniplate was placed on zygomatic buttress, a distalization force of 350 g was unilaterally applied to the maxillary left first molar through the sentalloy closed coil spring. After a distalization period of 6 months, a super Class I relationship was achieved and the maxillary left first molar moved 5 mm distally without anterior movement of the anchor premolars. In addition, the maxillary left molar slightly tipped distally (2.4°), the maxillary incisors slightly retruded (about -5°) and the overjet decreased (-1.4 mm). Then, preadjusted fixed appliances (0.022 × 0.028-in, Roth system) were placed in both arches and the maxillary premolar and canine were distalized using the miniplate anchorage after the leveling and alignment procedure. Class I molar and canine relationships, acceptable overjet and overbite were established in a total treatment time of 18 months.

**Key words:** Class II malocclusion, zygoma-gear appliance, skeletal anchorage

## Introduction

The orthodontist should consider several factors such as skeletal, vertical and sagittal properties, soft-tissue profile and patient compliance to reach a successful treatment of Class II patients.<sup>[1]</sup> After detailed considerations are done by clinicians, several methods<sup>[2-5]</sup> could be performed, if the maxillary molars are to be distalized.

The traditional approach to distalize maxillary molars is extra-oral traction and it may distalize not only maxillary first molar teeth but also first and second premolar teeth via transeptal fibers.<sup>[6]</sup> However, the success of its effect depends on patient co-operation and lack of patient co-operation might result in anchorage loss and thus unsatisfactory treatment results. In addition, the undesirable lateral forces that tend to move maxillary

molar teeth into crossbite were unavoidable during the unilateral molar distalization using headgear.<sup>[5]</sup> Due to the disadvantages of the extra-oral appliances, several investigators<sup>[2-5]</sup> used different intra-oral molar distalization mechanics. Although these appliances successfully distalized the maxillary molars, in most of those studies anchorage loss including protrusion of maxillary incisors, an increase in overjet and decrease in overbite was unavoidable.<sup>[7-9]</sup>

To eliminate the anchorage problems, miniscrews, osteointegrated implants and miniplates were used for anchorage units in patients needing maxillary molar distalization.<sup>[7,9-14]</sup> Of them, zygoma-gear appliance (ZGA) was shown to be an effective method for bilateral maxillary molar distalization.<sup>[9,15,16]</sup> A unique case report published by Kilis et al.<sup>[8]</sup> showed the successful use of this new system for unilateral maxillary molar distalization.

The aim of the present case report was to present the treatment of a patient with Class II subdivision using ZGA for unilateral maxillary molar distalization and fixed appliances for the further treatment needs.

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## Case Report

The present case is about a 15-year-old female patient who had a chief complaint of crowding in the anterior region of the maxillary arch presented to our clinic. The clinical and radiographic examinations of the patient's data (extra- and intra-oral photographs, cephalometric and panoramic films) revealed skeletal Class I and dental Class II subdivision malocclusion, retroclination of upper incisors, a 4 mm of overbite and 2 mm midline deviation to the right side. She had an Angle Class II molar relationship on the left side and a well Class I molar relationship on the right side. The maxillary and mandibular arch-length deficiencies were 4 mm and 2 mm, respectively. In contrast, there was no transverse discrepancy [Figures 1 and 2].

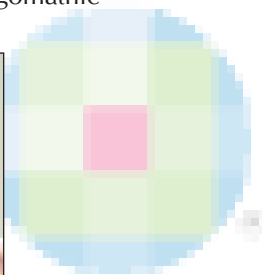
There were two treatment alternatives for this case: (1) Extraction of the maxillary left first premolar and (2) distalization of the maxillary left first molar. She and her family chose the non-extraction alternative. Using an intra-oral distalizing mechanic combined with zygomatic

miniplates for distalization of maxillary left first molar was chosen after considering the distalization mechanics.

The ZGA consisted of a miniplate, an inner bow and a sentalloy closed coil spring. The miniplate (Left Medium Plate, Lorenz, Florida, USA) was placed at the zygomatic buttress of the maxilla under local anesthesia by an experienced surgeon [C.C.] and fixed by three bone screws made of titanium (length, 5.0 mm; diameter, 2.0 mm) [Figure 3]. The ZGA was then prepared as described in the literature.<sup>[8,9,15,16]</sup> At 3 weeks after the surgery, a distalization force of 350 g was unilaterally applied to the maxillary left first molar via the sentalloy closed coil spring. On the right side not requiring distalization, the maxillary molar tube and the hook were ligatured. The force of coil spring was calibrated with a gram-force gauge and she was checked at 4 weekly intervals. After a distalization period of 6 months, a super Class I relationship was achieved and the maxillary left first molar moved 5 mm distally without anterior movement of the anchor premolars [Figure 4]. In addition, the maxillary left molar slightly tipped distally ( $2.4^\circ$ ), the maxillary incisors slightly retruded (about  $-5^\circ$ ), the overjet



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



**Figure 2:** Pre-treatment radiographs of the patient



**Figure 3:** The miniplate placed on zygomatic buttress



**Figure 4:** Intra-oral photographs of the patient after distalization

decreased ( $-1.4$  mm) and upper lip slightly retruded ( $-0.6$  mm) [Table 1]. Preadjusted fixed appliances (0.022  $\times$  0.028-in, Roth system) were placed in both arches. After the leveling and alignment procedure, maxillary premolar and canine were distalized using the miniplate anchorage. After 18 months of unilateral distalization with the ZGA and fixed appliances, Class I molar and canine relationships were established. Acceptable overjet and overbite were also achieved [Figure 5]. The miniplate was stable during the total treatment period and the patient was directed to the same surgeon [C.C.] for its removal.

## Discussion

The ZGA was firstly described by Nur et al.<sup>[15]</sup> for the bilateral maxillary molar distalization. The authors applied

**Table 1: The measurements of the patient before, after distalization and after orthodontic treatment**

Variables	Before distalization	After distalization	After treatment
SNA (°)	75.8	76.1	76.5
SNB (°)	74.8	74.7	74.3
ANB (°)	1	1.4	2.2
SN-GoMe (°)	40.6	40.8	39.9
U1/SN (°)	96.8	92	97.8
U1-NA (°)	21	16	25.3
U1-NA (mm)	3.2	2.5	6.1
IMPA (°)	91.2	91	97.1
L1-NB (°)	21.6	23.6	26.5
L1-NB (mm)	1	1.7	3.6
U6/ANS-PNS (°)	22.1	19.7	23
Overjet (mm)	3.9	2.5	1.5
Overbite (mm)	2.5	2.8	0
Upper lip-E line (mm)	-5.2	-5.8	-5.9
Lower lip-E line (mm)	-5.8	-5.1	-6.1
Nasolabial (°)	90.4	85.9	102.9



**Figure 5:** Extra- and intra-oral photographs of the patient after debonding

a distalization force of 400 g per side by elastics for the bilateral distalization of the maxillary molars. In addition, a study by Nur et al.<sup>[9]</sup> investigated the skeletal, dentoalveolar and soft-tissue effects of ZGA for bilateral maxillary molar distalization of 15 Class II patients and they showed that maxillary molar distalization without anchorage loss was achieved in a short time regardless of the patients' ages and the presence of second and third molars. Recently, Kilkis et al.<sup>[8]</sup> in their study showed its use for unilateral maxillary molar distalization. Zygomatic process of the maxilla for skeletal anchorage was previously found to be an appropriate region for maxillary molar distalization by several authors.<sup>[13,17]</sup>

In the present study, the ZGA was found to be effective for unilateral maxillary molar distalization since a 5 mm distalization of the maxillary left molar was achieved in 6 months, thus presenting a 0.83 mm distalization per month. This finding was in agreement with the previous studies<sup>[8,9,15]</sup> that showed from 0.8 to 1.3 mm distalization of maxillary molars per month using the same appliance. Although the amount of molar distalization in the present and in the previous studies<sup>[8,9,15]</sup> using ZGA was close to the previous studies<sup>[7,12,18]</sup> which used skeletal anchorage units such as miniscrews and osteointegrated implants applied to palatal regions, the maxillary molars to be distalized was less tipped during distalization with ZGA ( $2.4-5^\circ$ ) compared with the other distalization mechanics ( $9-12^\circ$ ).<sup>[7,12,18]</sup> In addition, anchorage loss such as proclination of maxillary incisors during distalization of the maxillary molar and molar mesialization during the distalization of the maxillary premolar and canine teeth was not observed in our study and in the previous studies<sup>[8,9,15]</sup> using ZGA. However, anchorage loss was found to be a common finding in previous studies using different distalization mechanics with/without skeletal anchorage on palatal region.<sup>[5,7,11,12]</sup>

Despite the several advantages of the ZGA, it has some disadvantages compared to different distalization mechanics such as the increased cost of the treatment due to the use of the miniplates, the need of minor surgical procedure to place the miniplate and the necessity of the second operation to remove it and the need of an experience surgeon to eliminate the mobility of the miniplate. Therefore, the authors of the present article suggest that the clinicians to use this system should consider its advantages and disadvantages prior to the treatment. According to the findings of the study published by Kaya et al.,<sup>[13]</sup> similar effects were observed in patients treated by cervical headgear and zygomatic anchorage system. The cervical headgear might be an alternative treatment choice

in co-operative patients who do not want to use ZGA due to the surgical need and/or increased cost of the treatment.

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