



# Unilateral Molar Distalization with an Implant-Supported Appliance: A Case Report of a Promising Alternative to Traditional Distalization Techniques

Amir Mohamadi,<sup>1</sup> Reza Sharqi,<sup>2</sup> and Somaieh Rahmanian<sup>3,\*</sup>

<sup>1</sup>Assistant Professor, Department of Orthodontics, Tabriz University of Medical Sciences, Tabriz, Iran

<sup>2</sup>Assistant Professor, Department of Orthodontics, Qazvin University of Medical Sciences, Qazvin, Iran

<sup>3</sup>Assistant Professor of Orthodontics, Kurdistan University of Medical Sciences, Sanandaj, Iran

\*Corresponding author: Somaieh Rahmanian, Assistant Professor of Orthodontics, Kurdistan University of Medical Sciences, Sanandaj, Iran. Tel: +98-9127961719, Fax: +98-4133355965, E-mail: somaieh.rahmanian93@gmail.com

Received 2016 July 31; Accepted 2017 January 17.

## Abstract

Conventional molar distalization methods in maxillary arch require patient cooperation with headgear or elastics, which is really difficult. Therefore, numerous different intraoral procedures have been presented to reduce the need for patient cooperation. In line with such attempts, our aim is to present an implant-supported appliance for successful unilateral molar distalization. To this purpose, we used an appliance that was supported by two palatal implants. Treatment outcomes were assessed by making use of lateral cephalometric views and dental models. Findings suggest that our implant-supported appliance is effective in correcting unilateral class II molar relationship with minor side effects compared to other distalizing appliances.

**Keywords:** Unilateral Molar Distalization, Implant

## 1. Introduction

Distal movements of maxillary molars are one of the treatment plans used for adult patients with class II malocclusion to create class I molar and canine relationship. However, after complete eruption of second molars in non-growing patients, distalization of maxillary molars becomes challenging. Furthermore, due to the need for unequal force system, maxillary unilateral molar distalization is more problematic (1).

For several years, asymmetric headgear force application was used regularly in cases with unilateral Angle class II molar relationship. However, it has been revealed that such a force system inevitably has a lateral component, which can dislocate upper molar in the transverse plane and produce posterior crossbite (2). The direction of vertical force should be controlled with the angulation of outer arms of the face bow, but in this state, a decreased amount of molar distalization could be expected (2).

Another major disadvantage of this appliance is its great dependence on patient compliance, which is difficult or impossible to obtain due to social and esthetic concerns (3). For this reason, this treatment approach has often been avoided by orthodontists.

Intraoral distalizing includes coil springs on a contin-

uous arch wire, the repelling magnet, superelastic nickel-titanium arch wires, coil springs on a sectional arch wire (Jones jig, distal jet, Keles slider), and springs in beta titanium alloy (pendulum, K-loop, intraoral bodily molar distalizer) (3).

These appliances are planned to apply nonstop reciprocal forces on maxillary molars, with inevitable mesial reactive forces on the anterior anchoring teeth. As a result, anchorage loss such as upper incisors protrusion or increased overjet, might happen (4). A side effect usually encountered in treatments using these appliances is an increased palatal, occlusal and mandibular plane angles resulting in an increased anterior facial height as a result of the distalization of the posterior teeth (2, 5). Still, some other disadvantages like relapse during retraction of premolars and anterior teeth, undesirable intermittent forces, and dependence on patient cooperation have rendered the aforementioned treatment modalities unpopular among orthodontists (1). Consequently, attempts have been made to discover new ways of approaching the problem at hand. Intraoral distalization mechanics combined with skeletal anchorage of Titanium anchor plates and monocortical screws, for instance, has recently attracted attention.

Sugawara et al. confirmed the distalization capability of a skeletal anchorage system of titanium anchor plates. But the surgical placement of a mini-plate is harder and more aggressive than mini-implant (5).

In this regard, mini-screws are considered as viable options due to having advantages which include: minimum anatomic limitation in placement, easy placement and removal, and lower costs; there is also no need for complicated clinical and laboratory phases, or for osseointegration when mini-screws are used.

One of the common areas for placement of mini-screws in molar distalization is the interdental area. Mini-screw placement in this area, however, has some disadvantages including: low mechanical stability of the mini-screw due to moderately low thickness of the cortical bone, injury potential to the roots of adjacent teeth, the need to use mini-screws with small diameters because of inadequate interdental space, the possibility of invasion to the maxillary sinus, inhibition of subsequent tooth movements, etc (6).

In this context, palate is a perfect site for mini-screws for maxillary molar distalization due to its acceptable cortical bone thickness which helps provide mini-screw stability (7). In our study, placing mini-implants on the buccal side caused the first molar to be distally tipped and extruded, while the incisors were labially flared and intruded.

Although there are numerous publications on bilateral non-compliance molar distalization systems, there is limited information on asymmetrical unilateral class II malocclusions. In this case report, we describe the treatment of a case with a skeletal class I malocclusion and unilateral class II canine relationship by skeletal anchorage.

## 2. Diagnosis

The patient was an 18-year-old man with the chief complaint of dental crowding. There were 9 and 10-mm arch-length discrepancies in the upper and lower arches, respectively.

Pretreatment facial photographs showed a convex profile, vertical facial proportions were normal, and there were no significant asymmetries. He had some carious teeth and upper right first premolar had already been extracted.

In centric relation, the right molar was class II, whereas the left molar relationship was class I (Figure 1). The mandibular midline deviated 3 mm toward the left. The patient had normal overjet and overbite.

In pretreatment cephalometric evaluation (Table 1), the maxilla was normal to the cranial base (SNA 83°), and in centric occlusion, the mandible was in normal position

to the cranial base (SNB 80°). The ANB (3°) indicated a class I skeletal relationship. Protrusion of lower incisors was detected in cephalometric radiograph (IMPA, 100).

Based on these findings, the patient was diagnosed with skeletal class I malocclusion with asymmetric molar relationships (Table 1).

**Table 1.** Pre-Treatment and Post-Treatment of Cephalometric Variables

Variables	Norms	Pretreatment	Posttreatment
SNA	82	83	83
SNB	80	80	80
ANB	+2	3	3
Ui-SN	103	103	102
IMPA	91	100	96
Interincisal angle	131	126	130
FMA	25	23	26
GoGn-SN	32	30	32
Gonial angle	125	125	125
LAFH		72	74
LAFH/TAFH, %	55	55	56
Jaraback index, %	62-65	63	64

### 2.1. Treatment Objectives

The treatment objectives for this patient were to:

(1) Relieve the crowding, which was his chief complaint, (2) Eliminate lower incisors protrusion, (3) Establish class I molar and canine relationships, and (4) Correct the mandibular midline shift.

Our treatment plan was a nonsurgical approach with extraction of the maxillary right first molar, maxillary left first premolar, mandibular right first molar and mandibular left second premolar. Unfortunately, in maxillary right side, the secondary molar was extracted by mistake of his dentist.

### 2.2. Treatment Progress

Before the orthodontic treatment, the patient was referred to extract intended teeth, unfortunately, the upper right second molar was extracted instead of the first molar (Figure 2), so our treatment plan changed, and we had to proceed with distalization of maxillary right first molar.

Upper first molars were banded and 022 Roth brackets were bonded on all maxillary and mandibular teeth. Two mini-implants (2x8-mm, Jail Medical Corp, Korea) were inserted in palate 1 - 2 mm aside of the midpalatal suture at the height of the contact point between the first molar and second premolars. After leveling and aligning teeth up to



**Figure 1.** Pre-Treatment Extra Oral and Intra Oral Photographs of Patient

0.019x0.025" stainless steel, an impression was obtained with the screw in place, and a plaster model was prepared. The distalization appliance was also made (Figure 3). Our distalization appliance was made of two wire parts and an acrylic button. Wire components are made of 0.036-inch stainless steel. After making these components, an acrylic button was formed and the site of mini-screws was perforated.

End portions of appliances were inserted in lingual sheets of maxillary first molar bands. Acrylic button was then fixed on screws by self-curing composite resin intraorally (Figure 4).

In this stage, two portions of appliance were joined by ligature wire on the right side. The patient was checked

every 4 weeks, and the force level of the activated appliance was checked and activated when necessary. The patient was instructed to brush the appliance with mild pressure so that no irritation would occur, and oral hygiene around the implant would be maintained. When upper right first molar was moved into an overcorrected class I relationship, the distalization ended. Molar distalization was completed in 6 months.

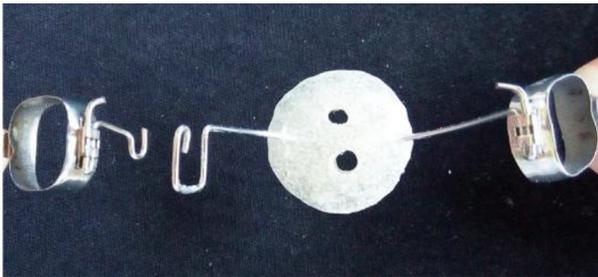
In lower arch, midline correction was done by a mini-screw between canine and first premolar on the right side.

### 2.3. Treatment Results

The insertion procedure of the screws was quick and simple. The patient reported no pain requiring analgesic



**Figure 2.** Unfortunately, in Maxillary Right Side, the Secondary Molar Was Extracted by Mistake, So Our Treatment Plan Changed, and We Had to Distalize Maxillary Right First Molar



**Figure 3.** Distalization Appliance



**Figure 4.** Distalization Appliance After Insertion

either after the insertion or during the distalization period. The screw was stable right after the insertion. Crowd-

ing, which was the patient's chief complaint, was eliminated at the end of the treatment. The midline deviation was corrected, and the dental midlines were aligned with the facial midline (Figure 5). The posterior occlusal relationships were improved to achieve class I canine and molar relationships on both sides. The right upper first molar was successfully distalized and the required space for upper crowding was gained. Distalization time was 6 months. Ideal overjet and overbite were established and correction of the malocclusion was accomplished with dental movements. The post treatment cephalometric analysis is given in the Table 1.

#### 2.4. Cephalometric and Model Analysis

At the end of the treatment, we drew midpalatal raphe in pretreatment and post-treatment models. Then distal to rugae, a reference point was selected and a line, which was perpendicular to midpalatal, was drawn in the two models. Another perpendicular line was drawn from mesial marginal ridge of right first molar. The distance between these two perpendicular lines was measured (by calculating magnification of photos) (Figure 6).

The maxillary right first molar distalization was 2.7 mm. Distalization was done by bodily movement of maxillary first molar (Figure 7). The remained class II molar relationship was corrected by mesial movement of mandibular right first molar. First molar position is shown in pretreatment and post-treatment intra oral photographs (Figure 8).

Measurement of central incisor angle to SN shows that proclination of incisors has not happened. (Table 1) As seen in the Table 1, there is a slight increase in vertical dimensions (LAFH), which is one of the major side effects of conventional molar distalization appliances (Table 1).

### 3. Discussion

Anchorage control is of great importance in orthodontic treatment. In the treatment of Angle class II malocclusions, with class I skeletal relationship, upper anterior crowding or excessive overjet can be treated with either unilateral/bilateral upper premolar extraction or distalization of upper posterior teeth consolidation of the anterior teeth. However, successful treatment using extraoral appliances is strongly dependent on patient cooperation (1). Researchers have used intraoral distalization mechanics alternatively in the extraction treatment.

Conventional intraoral distalizing appliances has several defects. First, in the sagittal plane, the anchor unit, such as a palatal wire frame connecting the first and second premolars coverage, cannot perfectly prevent reciprocal mesial force, thus causing anchorage loss (significant



**Figure 5.** Post-Treatment Extra Oral and Intra Oral Photographs of Patient.

maxillary incisor proclination and increased overjet at the end of the distalization) (8). and intraoral mucosa irritation. Also, distal tipping of the maxillary first molar occurs. Second, in the vertical plane, most intraoral distal movement appliances tend to extrude the maxillary molars, which in turn increases the mandibular plane (8). Orthodontic implants have, therefore, been developed as an effective solution to many of these problems.

We used the mini-screw alternatively in the osseointegrated implants that would provide enough stability to actively distalize maxillary molars unilaterally, and provide

anchorage in general.

The insertion procedure took some minutes, but did not need the opening mucoperiosteal flap. No bleeding or excessive pain in the adjacent tissues to the screw was detected and the screw showed primary stability. This distalization system efficiently distalized the maxillary molar teeth to a class I relationship without any cooperation problems for patients.

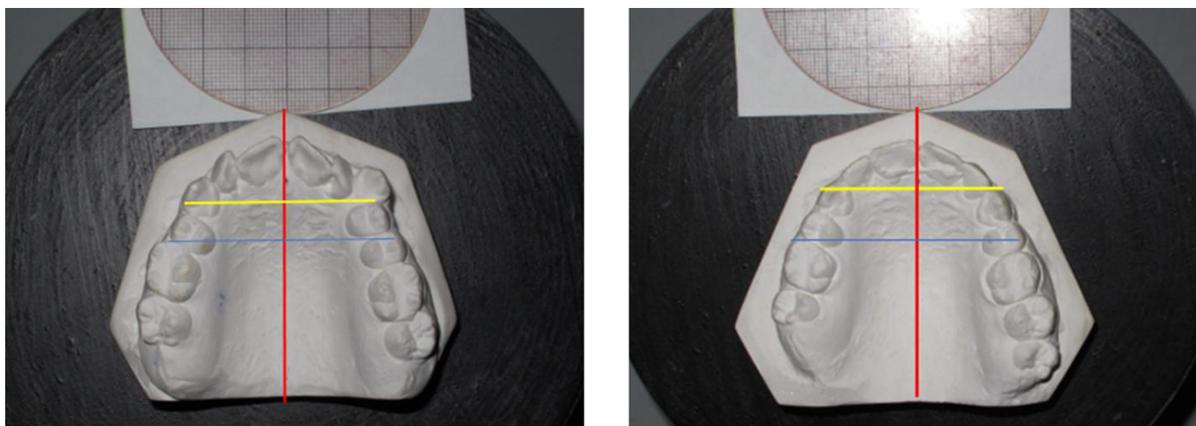


Figure 6. Reference Lines for Measurement of Molar Distalization

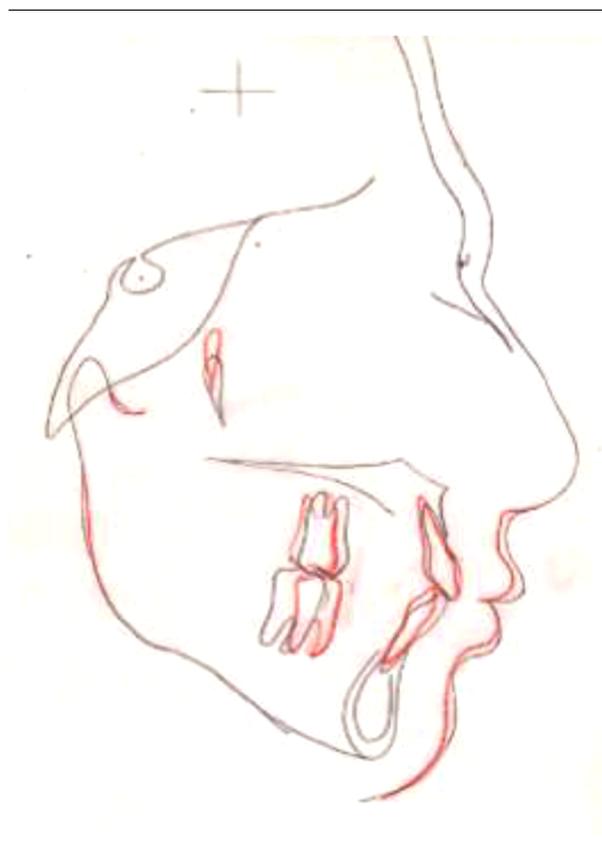


Figure 7. Superimposition of Pre-Treatment and Post-Treatment Lateral Cephalogram Shows 3 mm Upper Molar Distalization

### 3.1. Conclusion

The esthetic and compliance free nature of this distalization system seems to be superior to the previous methods. This relatively simple treatment mechanics use direct

anchorage to accomplish efficient, bodily molar distalization while simultaneously minimizing unwanted vertical dimension changes.

### References

1. Ishida T, Yoon HS, Ono T. Asymmetrical distalization of maxillary molars with zygomatic anchorage, improved superelastic nickel-titanium alloy wires, and open-coil springs. *Am J Orthod Dentofacial Orthop.* 2013;**144**(4):583-93. doi: [10.1016/j.ajodo.2012.10.028](https://doi.org/10.1016/j.ajodo.2012.10.028). [PubMed: [24075667](https://pubmed.ncbi.nlm.nih.gov/24075667/)].
2. Altug H, Bengi AO, Akin E, Karacay S. Dentofacial effects of asymmetric headgear and cervical headgear with removable plate on unilateral molar distalization. *Angle Orthod.* 2005;**75**(4):584-92. doi: [10.1043/0003-3219\(2005\)75\[584:DEOAHA\]2.0.CO;2](https://doi.org/10.1043/0003-3219(2005)75[584:DEOAHA]2.0.CO;2). [PubMed: [16097227](https://pubmed.ncbi.nlm.nih.gov/16097227/)].
3. Mavropoulos A, Sayinsu K, Allaf F, Kiliaridis S, Papadopoulos MA, Keles AO. Noncompliance unilateral maxillary molar distalization. *Angle Orthod.* 2006;**76**(3):382-7. doi: [10.1043/0003-3219\(2006\)076\[0382:NUMMD\]2.0.CO;2](https://doi.org/10.1043/0003-3219(2006)076[0382:NUMMD]2.0.CO;2). [PubMed: [16637715](https://pubmed.ncbi.nlm.nih.gov/16637715/)].
4. Lim SM, Hong RK. Distal movement of maxillary molars using a lever-arm and mini-implant system. *Angle Orthod.* 2008;**78**(1):167-75. doi: [10.2319/102506-438](https://doi.org/10.2319/102506-438). [PubMed: [18193963](https://pubmed.ncbi.nlm.nih.gov/18193963/)].
5. Chung KR, Kim SH, Chaffee MP, Nelson G. Molar distalization with a partially integrated mini-implant to correct unilateral Class II malocclusion. *Am J Orthod Dentofacial Orthop.* 2010;**138**(6):810-9. doi: [10.1016/j.ajodo.2008.07.027](https://doi.org/10.1016/j.ajodo.2008.07.027). [PubMed: [21130341](https://pubmed.ncbi.nlm.nih.gov/21130341/)].
6. Yu IJ, Kook YA, Sung SJ, Lee KJ, Chun YS, Mo SS. Comparison of tooth displacement between buccal mini-implants and palatal plate anchorage for molar distalization: a finite element study. *Eur J Orthod.* 2014;**36**(4):394-402. doi: [10.1093/ejo/cjr130](https://doi.org/10.1093/ejo/cjr130). [PubMed: [22051536](https://pubmed.ncbi.nlm.nih.gov/22051536/)].
7. Gelgor IE, Buyukyilmaz T, Karaman AI, Dolanmaz D, Kalayci A. Intraosseous screw-supported upper molar distalization. *Angle Orthod.* 2004;**74**(6):838-50. doi: [10.1043/0003-3219\(2004\)074\[0838:ISUMDgt;2.0.CO;2](https://doi.org/10.1043/0003-3219(2004)074[0838:ISUMDgt;2.0.CO;2). [PubMed: [15673149](https://pubmed.ncbi.nlm.nih.gov/15673149/)].
8. Gelgor IE, Karaman AI, Buyukyilmaz T. Use of the intraosseous screw for unilateral upper molar distalization and found well balanced occlusion. *Head Face Med.* 2006;**2**:38. doi: [10.1186/1746-160X-2-38](https://doi.org/10.1186/1746-160X-2-38). [PubMed: [17094798](https://pubmed.ncbi.nlm.nih.gov/17094798/)].



**Figure 8.** Pre-Treatment and Post-Treatment Intraoral Photographs Show First Molar Position.

---