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CASE REPORT

Nonextraction Treatment of a Class III Malocclusion Case Using Mini-Screw-Assisted Lower Molar Distalization

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ABSTRACT

Mini-screw assisted lower molar distalization was planned for a present mild Class III malocclusion case. Two mini-screws were inserted into the available inter-root area: one on the left, and the other on the right side in the posterior region in the mandible. Distalization of lower molars, premolars and canines were achieved. Orthodontic treatment lasted approximately 2.5 years with 1 year of molar distalization. Minimal relapse was seen in the postretention period. Dentoalveolar changes with mini-screw assisted lower molar distalization are reported in the present case.

Keywords: Mini-screw, lower molar distalization, Class III malocclusion

INTRODUCTION

Camouflage treatment of mild Class III malocclusion may include distalization of mandibular dentition besides a number of other treatment modalities. Mostly, intermaxillary elastics with fixed appliances have been used for this purpose (1). However, Class III elastic wear causes unwanted side effects, such as maxillary incisor proclination, maxillary molar and mandibular incisor elongation and it also tends to widen maxillary molars, roll their crowns lingually besides requiring patient compliance (2).

To prevent these undesirable effects, absolute anchorage systems have been applied for either en-masse distalization of mandibular dentition or molar distalization (3-10). In the present case report, we introduce a nonextraction and nonsurgical treatment of Class III malocclusion using mini-screw-assisted mandibular molar distalization.

CASE PRESENTATION

The patient was a 18-year-old Turkish man who had a sightly concave profile, symmetric face and retrusive lips with an acute nasolabial angle. Intraoral examination revealed Angle Class III molar relationship, anterior crossbite and moderate crowding in both arches. Overjet was -2mm and overbite was 0.5mm (Figure 1).

Lateral cephalometric analysis indicated mild skeletal Class III relationship with maxillary retrusion, optimum mandibular plane angle and normal upper and lower incisor positions (Table 1).

Treatment Plan and Procedure

In the present case, the extraction of mandibular third molars and mini-screw supported lower molar distalization was planned to provide Angle Class I molar relationship and solve crowding. Bone anchorage was provided

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by two mini-screws (1.6×8mm Metin mini-screws (MTN), Medifarm, Ankara, Turkey] placed into an available inter-root area. On the right side, one of the mini-screws was inserted between the first molar and second premolar, whereas on the left side it was inserted between the premolars (Figure 2).

A segmented archwire bent from 0.017×0.025″ stainless steel archwire was inserted between the slot of the mini-screw and an auxiliary tube of the second molar. Force (200g) was applied via a compressed open coil for second molar distalization. After the second molar distalization, the first molars were distalized using mini-screws as second molars, then premolars were distalized on the continuous archwire with closed coils while the first molars were kept in place using mini-screws (Figure 3).

In the maxillary arch, protrusion of incisors was planned to align the anterior teeth and correct cross-bite. Lateral cephalograms of the patient were obtained prior to (T0) and at the end of full-fixed orthodontic treatment(T1), 1.8 years after fixed orthodontic treatment (T2; Figure 4).

Table 1. Skeletal, dental, and soft-tissue measurements prior to treatment (T0), at the end of treatment (T1), and after a postretention period (T2)

	T0	T1	T2
SNA (°)	78	78	78
SNB (°)	79	79	79
ANB (°)	-1	-1	-1
S-Go (mm)	91	91	91
ANS-Me (mm)	75	75	75
SNGoGn (°)	31	32	32
U1-NA (mm)	5	8	7
U1/PP (°)	115	131	128
L1-NB (mm)	5	6	6.5
IMPA (°)	89	91	93
Overjet (mm)	-2	2	0.5
Overbite (mm)	0.5	1	1
Upper lip-SL (mm)	-4	-2	-2
Lower lip-SL (mm)	0	-1	-1
Nasolabial (°)	117	109	110

Figure 1. Intraoral and extraoral photographs of the patient prior to treatment (T0)

Figure 2. Placement of two mini-screws between available posterior interroot area in mandibula

Treatment Results

Orthodontic treatment lasted approximately 2.5 years, with 1 year of molar distalization. At the end of the full-fixed treatment, crowding was eliminated and Class I canine and super Class I molar relationship with 2mm of overjet and 1mm of overbite was

Figure 3. Intraoral photograph of the patient showing the distalization phase

Figure 4. Lateral cephalograms of patient were taken at prior to treatment (T0), at the end of treatment (T1), after postretention period (T2)

Figure 5. Intraoral and extraoral photographs of the patient at the end of treatment (T1)

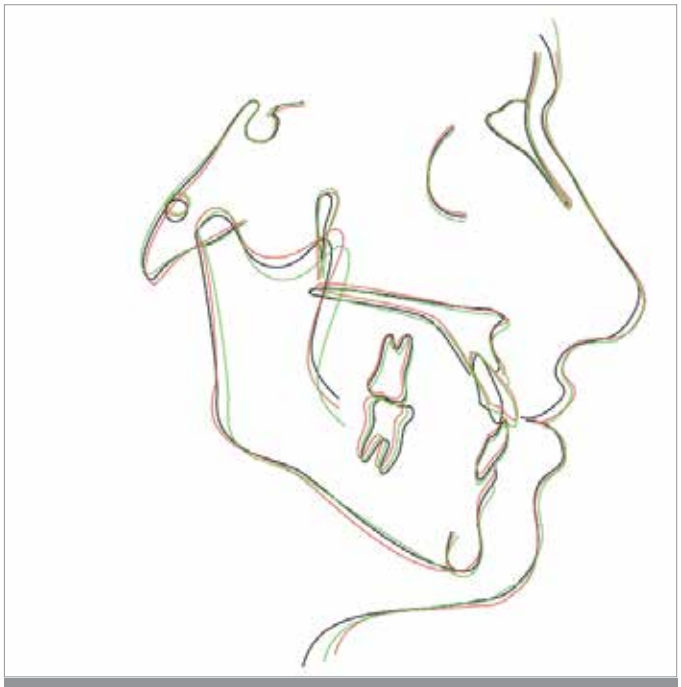

Figure 6. Total cephalometric superimpositions

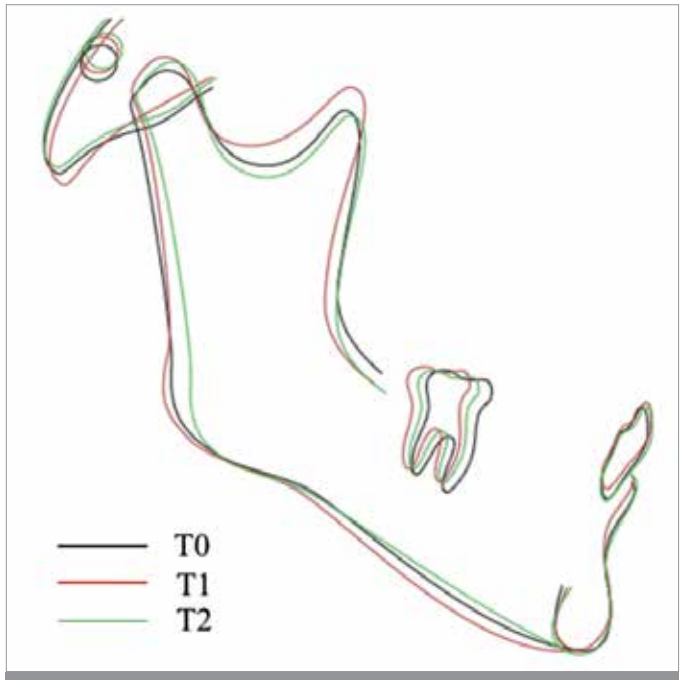

Figure 8. Local mandibular superimpositions. 1: LMcs. Sagital linear change of molar mesiobuccal cusp tip

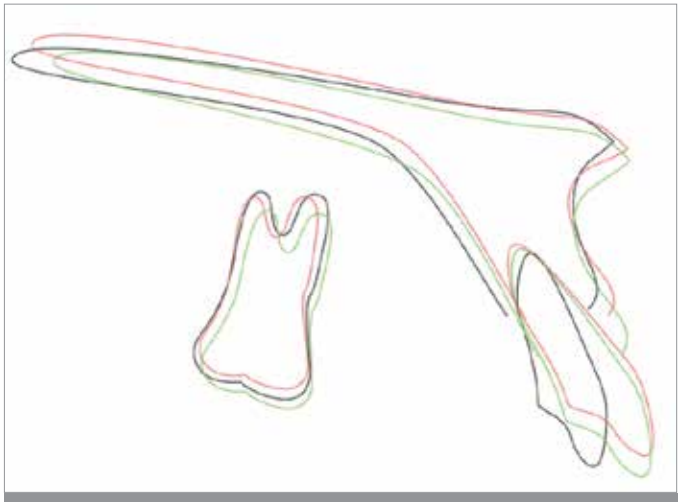

Figure 7. Local maxillary superimpositions

Figure 9. Intraoral and extraoral photographs of the patient after postretention period (T2)

obtained (Figure 5). Slight advancement in profile was achieved owing to the protrusion of upper lip position (Figure 6). Local superimpositions revealed prominent protrusion of upper incisors, slight protrusion of lower incisors, and distalization of lower molars (Figure 7, 8; Table 1). Minimal relapse was seen in the postretention period (Figure 9).

DISCUSSION

The severity of the skeletal problem, growth pattern, facial profile and patient requirements are important in managing skeletal Class III malocclusions (7). In this mild skeletal Class III case, we preferred camouflage treatment. After treatment, his facial profile slightly improved owing to the protrusion of the upper lip.

Another treatment option, in this case, was to extract four premolars; however, this would lead to more retrusive lips, which could have worsened the profile. Another camouflage treatment option was to extract one mandibular incisor. However, the patient rejected either extractions. Therefore, mini-screw assisted mandibular molar distalization was preferred to correct the Class III malocclusion without teeth extractions, and positive overjet was achieved with the protrusion of maxillary incisors.

Class III elastic, which is one of the most widely used mechanisms for Class III correction, has disadvantages, such as the need for patient cooperation, tipping movement, anchorage loss and extrusion of maxillary molars (2). Here, extrusion and mesialization of maxillary molars would have increased the arch discrepancy and caused an open-bite tendency. However, with this system, direction of distalization force was passing through the center of resistance of molars, which avoided extrusion. Thus, mini-screw-assisted distal movement of the mandibular posterior teeth eliminated these undesirable effects.

In the previously reported mechanotheraphy, mini-screws or mini-implants were inserted into different areas for mandibular molar distalization (3-10). Some authors placed mini-plates or mini-screws into the anterior border of mandibular ramus and performed either en-masse distalization of mandibular dentition or tooth distalization (3-6). The posterior alveolar bone is an alternative site for posterior anchorage. Chung et al. inserted a C-shaped mini-implant into the maxillary molar area for Class III elastic usage through this implant (8). Later, Chung et al. inserted C-implants between the mandibular first molar and second premolar, like in our system, as close as possible to the first molar root. In this system, second molars were distalized using a sliding jig connected to the main archwire that transferred the elastic forces to second molars applied from the mini-screws. (9). Jing et al. vertically implanted the mini-screws into external oblique ridge areas of the bilateral mandibular ramus between the first mandibular and second molar for en-masse distalization(10). This area reportedly offers more simple and stable force systems (11). Here, a mini-screw was inserted into the available mandibular posterior inter-root area. The implant site was based on cortical bone thickness, bone hardness, anatomic structures, and soft-tissue functional movements. The quantity and quality of the cortical bone greatly influenced the failure force of mini-screw implants (12,13). Different from in the other studies, the present system of posterior inter-root area can be used for mini-screw insertion. Also, there is no need for full-fixed systems or to wait for leveling at the beginning of the treatment. Distalization can be immediately started. Further, this system differs in that the lower second molar is distalized by the frictionless system; it distalizes with the arch and does not slide on the archwire.

In the present case, mandibular molars distalized 3mm of each side of the arch. In the literature, molar distalization amounts with the assistance of mini-implants or mini-plates vary between 2-6mm. Sugawara et al. achieved mandibular molar distalization of 3.5mm at the crown level and 1.8mm at the root level, and the average amount of relapse was 0.3mm at both the crown and root apex levels (3). Poletti et al. (8) reported 4mm of molar distalization with a tipping of 10° (4). A case report stated that a mandibular dentition was distalized 5 and 2mm on the left and right sides, respectively. Jing et al. (10) reported 4mm of distalization without undesirable tipping.

The relapse amount in distalized mandibular molars during the postretention period, in this case, was 1mm. There are different reports about correlations between tipping and relapse. Chung et al. (9) stated that the larger the amount of tooth movement and the more the teeth are tipped, the greater is the relapse. However, Sugawara et al. (3) found no significant correlations between the amount of relapse and tipping ratio and the amount of tooth movement.

CONCLUSION

Thus, mini-screw supported mandibular molar distalization can be proposed as an effective treatment alternative for avoiding routine teeth extractions in borderline III cases.

Informed Consent: Written informed consent was obtained from the patient who participated in this study.

Peer-review: Externally peer-reviewed.

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