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Distalization of Maxillary Molars by Miniscrews and EZ Slider

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KEYWORDS

EZ slider, distalization, miniscrews.

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- A paper extracted from Doctor's Thesis entitled "Distalization of Maxillary Molars Depending on Miniscrews Positions in Sliding Mechanics".

ABSTRACT

Objectives: The aim of the current study was to evaluate distalization of the maxillary 1st molars by sliding mechanics depending on the numbers of miniscrews.

Materials and Methods: The current study was conducted on a total sample of twenty adult orthodontic patients presented with class II maxillary permanent first molars indicated for distalization with an age ranged from 18-23 years. For every patient enrolled in the present study, routine orthodontic records were taken before the treatment and after eight months or the end of distalization. Patients were treated by using EZ slider as a distalizer with one miniscrew inserted on the buccal side between the 1st permanent molar and the 2nd permanent premolar and in the other side the distalizer EZ slider with two miniscrews inserted in which one inserted between the 1st permanent molar and the 2nd permanent premolar and the next miniscrew was inserted between the 2nd permanent premolar and the 1st permanent premolar.

Results: The side in which two miniscrews inserted and the EZ slider showed more distal movement of the 1st permanent molar than the side with one miniscrew and the EZ slider due to the double force used.

Conclusion: EZ slider is a simple and an effective appliance for molar distalization. Which has no specific protocol to be used effectively.

INTRODUCTION

Class II malocclusions are one of the most common problems seen by an orthodontist.[1] Correction of Class II malocclusion is probably the most important single component of present orthodontics. Different treatment approaches have been suggested, ranging from variable types of functional appliances aiming at skeletal correction to a constantly increasing number of ways to distalize molars.[2]

Extraction and non-extraction are two opposite treatment strategies. Each has its own advantages. One of the most important advantages ofnon-extraction treatment is the preservation of sound teeth and better

facial and dental esthetic can be achieved in many patients by avoiding mid arch extraction.[3-6]

Distalization or the up righting of the molars may be indicated for patients with mild to moderate crowding. Many attempts are introduced to produce distalization of the first permanent molar to create space and hence correct the tooth crowding and avoid tooth extraction. Among these are different types of Headgear, Class II elastics, and an increasing number of noncompliance appliances such as Herbst appliance, pendulum appliance, Jones Jig, Distal jets, Magnets, first class appliance and other different appliances.[7]

* Ortho-Technology Company

Intraoral molar-distalization appliances that require little or no patient complianceincluding the Pendulum, Distal Jet, and sliding jigs have been developed as alternatives to headgear. To avoid the anchorage loss that often occurs with these devices, skeletal anchorage has increasingly been employed, leading to the introduction of new systems.

The EZ Slider*[8] sliding auxiliary for use with mini-implants in the distalization of posterior segments was introduced for this purpose.

MATERIALS AND METHODS

The current study was conducted on a total sample of twenty adult orthodontic patients presented with class II maxillary permanent first molars indicated for distalization with an age ranged from 18-23 years.

The sample was selected from patients seeking orthodontic treatment in out-patient clinic, Orthodontic Department, Faculty of Dental Medicine, Al-Azhar University, Assiut, Egypt.

Sample size calculation

Sample size calculation was based on the observed effect sizes derived from previous articles focusing the effect of EZ distalizer on the maxillary permanent first molars distalization according to the method.[8]

The calculation indicated that for a study with a power of 0.95 and an alpha of 0.05, a total of at least 8 patients.

Orthodontic Records:

For every patient enrolled in the present study, routine orthodontic records were taken before the treatment **(T1)** including:

1. Standardized study models.
2. Standardized extra-oral and intra-oral photographs.
3. Standardized lateral cephalometric radiographs.
4. Panoramic radiographs.
5. Maxillary first permanent molars periapical radiographs.

A second set of records were taken after eight months or after the end of distalization (T2) from the baseline including:

1. Standardized study models.
2. Standardized extra-oraland intra-oral photographs.
3. Standardized lateral cephalometric radiographs.

Components of the EZ distalizer appliance:[8]

EZ Sliders, Developed by Dr. EnisGüray[8] made of medical-grade 304 stainless steel, are interchangeable auxiliaries for the delivery of distal or mesial forces in conjunction with buccally placed TADs and closed-coil springs.

* Mini 2000 Dentaurum

With their secure “click-in-click-out” arms, they can easily be clipped to any archwires. Parallel force application prevents unwanted tooth movements such as rotations and tipping

Left-and right-side variations come in three lengths. In normal posterior-distalization treatment,

the long (30mm) Slider is used initially to apply force to the second molars, followed by the medium (20mm) Slider for the first molars and the short (12.5mm) Slider for the premolars and canines.

Treatment protocol steps:

After collecting the patients record clinical examination was done and then start the treatment protocol.

1- Bonding:

Bonding was performed using green-glo orthodontic compositeand by using orthodontic brackets pre-adjusted Roth 0.22* by the sameoperator.

2- Levelling and alignment:

Pre-adjusted .022" Roth bracketsand bondable tubes were bonded by the same operator using no mix composite, then instalment of 14" niti wire for three weeks followed by 16" niti for another three weeks followed by 18" niti for other three weeks followed by 16x22" niti for two weeks and finally nearly after three months from bonding the application of 16x22" stainless steelwire is possible and the arch is ready for distalization.

3- Instalment of TADs:

Miniscrews* were inserted bilaterally between the upper second premolars and first molars on both sides and in one side another miniscrew was inserted between the 1st and the 2nd premolars. After .022" Roth brackets were bonded and 16x22"st.starchwire was placed.

4- Distalization protocol:

A distalizing force of 250g was applied on from every miniscrew with a nickel titanium closed-coil spring or by memory shaped power chains from the mini-implant to the power arm of a 30mm EZ Slider.

Single side inserted miniscrew: where only one miniscrew was placed between the 1st molar and the 2nd premolar a 250 g was applied from the single miniscrew to the EZ slider.

On the other side: where two miniscrews were inserted between the 1st molar and the 2nd premolar and the second miniscrew was inserted between the 1st premolar and the 2nd premolar. a 500 g force were applied on this side 250 g from each miniscrew to the EZ slider appliance.

The force system was renewed every two weeks and the operator was checking the appliance integrity* Ortho Pro Miniscrews and any broken piece was replaced immediately and reported for every patient.

The whole sample was included as one group in which the same protocol was carried out as the same with all patients.the patients were treated by using EZ slider as a distalizer with one miniscrew inserted on the buccal side between the 1st permanent molar and the 2nd permanent premolar and in the other side the distalizer EZ slider with two miniscrews inserted in which one inserted between the 1st permanent molar and the 2nd permanent premolar and the next miniscrew was inserted between the 2nd permanent premolar and the 1st permanent premolar.

RESULTS

Dental measurements

The descriptive statistics [Mean, (SD), and Standard Error (SE)] of all skeletal measurementsbefore treatment and after treatment measurements presented in table 1.

Also, the comparison of the dental measurements before treatment and after treatment measurements by using t-test were also shown in table 1

Study cast measurements:

A)-Linear measurements:

Descriptive statistics of dental measurements (mm) showing mean, SD, median, minimum, maximum and % change values pre and post orthodontic treatment were represented in table 1.

Table 1.

Variables	Before Treatment			After Treatment			Difference Mean	P value
	SD	Mean	SE	SD	Mean	SE		
SNA	80.4	3.6	1.1	80.8	3.3	1.1	0.4	0.104
SNB	78.1	3.8	1.2	78.3	3.9	1.2	0.2	0.509
ANB	2.3	0.7	0.2	2.5	0.9	0.3	0.2	0.168
MPA	29.5	5.7	1.8	31.3	5	1.6	1.8	0.153
LAFH	68.5	4	1.3	70.5	4.3	1.4	2	<0.001*
Study cast measurements								
		Mean	SD	Median	Min.	Max.	Change (%)	P value
Inter-canine width	before	32.63	2.46	31.9	29.4	36.5	2 (6.13%)	0.024*
	After	34.63	1.94	35.2	31.9	36.7		
Inter- 1st Premolar width	before	41.13	3.25	42.5	36.7	46.2	1.7 (4.17%)	0.014*
	After	42.84	2.48	43	38.2	46.7		
Inter- 2nd Premolar width	before	43.61	3.41	44.3	38.2	48.5	2.3 (5.27%)	0.07 NS
	After	45.91	3.07	47.6	40.2	49.2		
Inter- 1st molar width	before	47.8	2.91	46.5	44.4	52.6	0.91 (1.91%)	0.47 NS
	After	48.71	2.75	49.8	42.5	52.2		
Inter- 2nd molar width	before	52.01	2.73	51.9	47.1	55.4	0.7 (1.35%)	0.35 NS
	After	52.71	2.50	54.1	47.9	55.7		
Arch diameter	before	80.89	2.13	81.8	77.5	83.9	4.66 (5.76%)	0.0008 *
	After	85.54	2.55	84	82.4	91.8		

SD *Standard Deviation*

SE *Standard Error*

NS *Non-Significant difference*

* *Significant difference at (P<0.05).*

B)-Angular measurements:

Angular measurements

1-1st Premolar to medium palatine angle (°)

With ***single screw;*** 1st Premolar to medium palatine angle mean value pre-orthodontic treatment was (73.21429 o) while post treatment mean value was (68.34286°).

With ***double screw;*** 1st Premolar to medium palatine angle mean value pre-orthodontic treatment was (56.9 o) while post treatment mean value was (57.08571o).

2-2nd Premolar to medium palatine angle (°)

With ***single screw;*** 2nd Premolar to medium palatine angle mean value pre-orthodontic treatment was (59.15714°) while post treatment mean value was (57.21429°).

With ***double screw;*** 2nd Premolar to medium palatine angle mean value pre-orthodontic treatment was (57.78571°) while post treatment mean value was (58.21429°).

3-1st molar to medium palatine angle (°)

With ***single screw;*** 1st Molar to medium palatine angle mean value pre-orthodontic treatment was (37.3571°) while post treatment mean value was (40.471°).

With ***double screw;*** 1st Molar to medium palatine angle mean value pre-orthodontic treatment was (33.69°) while post treatment mean value was (36.8°). It was found that 1st Molar to medium palatine angle mean value increased significantly post orthodontic treatment with % change (9.25%) as verified by paired t-test (P=0.02< 0.05).

4- 2nd molar to medium palatine angle (°)

With ***single screw;*** 2ndMolar to medium palatine angle mean value pre-orthodontic treatment was (54.2281°) while post treatment mean value was (61.3857°).

With ***double screw;*** 2nd Molar to medium palatine angle mean value pre-orthodontic treatment was (55.7142°) while post treatment mean value was (60.828°).

5- canine to medium palatine angle (°)

With ***single screw;*** canine to medium palatine angle mean value pre-orthodontic treatment was

(35.67°) while post treatment mean value was (39.43°).

With ***double screw;***canine to medium palatine angle mean value pre-orthodontic treatment was (35.671o) while post treatment mean value was (37.978o).

The obtained results for the previously mentioned parameters were illustrated in table 2.

Table 2.

Measurement			Change (%)	P Value
1st premolar	Single	Before / After	-4.87 (6.55%)	0.1242 ns
	Double	Before / After	0.19 (0.33%)	
2nd premolar	Single	Before / After	-1.94 (3.28%)	0.2886 ns
	Double	Before / After	0.42 (0.74%)	
1st molar	Single	Before / After	3.1(8.34%)	0.99 ns
	Double	Before / After	3.11 (9.25%)	
2nd molar	Single	Before / After	7.12(13.19%)	0.276 ns
	Double	Before / After	5.11(9.18%)	
Canine	Single	Before / After	3.76(10.53%)	0.412 ns
	Double	Before / After	2.31(6.47%)	

**; significant (p<0.05)*

NS; non-significant (p>0.05)

DISCUSSION

Molar distalization in adults has been considered difficult, which is contrasted by recent evidence of molar distalization using miniplates fixed with multiple bone screws, [5] with a major advantage being thelimination of side effects such as forward movement of premolars and incisors. [3-6]

This study was designed to clarify the clinical effect of multiple miniscrews in conjunction with EZ slider bilaterally implicating the change in both the direction and the magnitude of force vector(s) given to the arch. [8,9]

Statistically significant distalization of molars and incisors was found in allpatients. The average amount of molar distalization in group A was comparable to or less than those in the previous studies. [5,8, 9]

Greater molar distalization in double miniscrews may be related to double magnitude force from using dual screws, supporting the study of Oh et al., 2011 [10] The prospective selection of subjects and individual variation caused by the cortical bone thickness, pattern of sinus pneumatization, and occlusal force may explain the discrepancy among studies.

Considering the insufficiency of force from single miniscrew, the results of this study may reflect the practical outcome when using interradicular miniscrews for whole arch distalization, suggesting the use of dual miniscrews to achieve clinically meaningful distalization to correct end-to-end Class II molar relation. Simultaneous movement of the total arch using monocortical miniscrews may therefore be a strong treatment option for non-extraction treatment of Class II in terms of treatment efficiency.

Tipping of the molars was found to be minimal. This result was similar to that of other skeletal anchorage devices and in contrast to that of conventional distalizers.

Considering that the translation of a single molar using palatal miniscrews usually takes high accuracy of appliance design. [9-11]

An interesting finding was the vertical displacement of the maxillary occlusal plane. While group A displayed a clockwise rotation of the occlusal plane, which was similar to Yamada et al., [5]group B showed significantly less rotation. The center of resistance of the maxillary dentition has been shown to be located around the middle area of premolar roots. Moreover, the vector angles in group B were measured higher than in group single miniscrew position and number may be the determinants for selective vertical control for long face unlike the conventional intrusion archwires causing extrusion of the posterior segment. [12]

The correlation pattern between the two groups reveal that the amount of tooth displacement is more related to the duration of retraction in group A, which implies that single miniscrews may take more time to achieve desired anteroposterior correction. [9]

In this study, EZ Slider mechanics was found to cause molar extrusion and premolar intrusion, so This is in accordance with Güray et al.,2014 who found similar findings and recommended that the appliance should not be used in high-angle cases. [8]

The maxillary incisors remained unchanged, this was in contrary to the Sayinsu et al. in their study the maxillary incisors were protruded 1.32 mm ($P < 0.01$) with 1.79 degrees ($P < 0.01$) of labial tipping and 1.12 mm ($P < 0.001$) extrusion. Similar results have been repeated in studies investigating the effects of intraoral distalization appliances. It should therefore be borne in mind that maxillary incisors tend to tip labially regardless of the type of distalization appliance. [13]

CONCLUSION

EZ slider is a simple and an effectiveappliance for molar distalization. which has no specific protocol to be used effectively. EZ slider appliance has 3 different sizes one size for 2nd molar distalization, 2nd size for 1st molar distalization and the 3rd size for premolars distalization. According to this thesis no need to use the 1st size of the EZ slider appliance as the 2nd size can move two or three molars distally.

REFERENCES

1. Profit WR, Fields H. Contemporary orthodontics, Mosby, 3rd ed,2000.
2. Zentner A. The problem of compliance in orthodontics. In Papadopoulos M A editor.Orthodontic Treatment of Class II Malocclusion. Current principles and techniques. Edinbergh;Elsevier -Mosby:2006:3-7.
3. Russell K. Distalizing upper first permanent molars. Evid Based Dent. 2004;5:77.
4. Ghosh J, Nanda RS. Evaluation of an intraoral maxillary molar distalization technique. Am J Orthod Dentofacial Orthop. 1996;110:639–46.
5. Papadopoulos M A.Non-compliance distalization. A monograph on the clinical management and effectiveness of a jig assembly in Class II malocclusion orthodontic treatment.Eur JOrthod. 2006;28(3):305-10.
6. Counihan D. Non-extraction treatment in the mixed dentition. J Clin Orthod. 2000;34:332-47.
7. Bishara SE,Cummins DM, Zaher AR.Treatment and post treatment changes in patients with classII division 1 malcclusion after extraction and non-extraction treatment. Am J Orthod.1997;111:18-27.
8. Güray E, Ucar F, Gul N. Distalization with the Miniscrew Supported EZ Slider Auxiliary.JCO; 2014:48:238-47.
9. Bechtold TE, Kim JW, Lee KJ. Distalization pattern of the maxillary arch depending on the number of orthodontic miniscrews. Angle Orthod.2013;83(2): 266-73.
10. Oh YH, Hyo-Sang Park SH.Treatment effects of micro implant-aided sliding mechanics on distal retraction of posterior teeth. AJO-DO, 2011;139(4):470-81
11. Mohamed RN; Basha S; Al-Thomali Y. Maxillary molar distalization with miniscrew-supported appliances in Class II malocclusion: A systematic review. Angle Orthod. 2018;88(4):494–502.
12. Uribe F, Nanda R. Treatment of Class II, Division 2 Malocclusion in Adults: Biomechanical Considerations. JCO.2003;36(11): 599-606.
13. Keles A. Maxillary unilateral molar Distalization with sliding mechanics: apreliminary investigation. Eur J Orthod.2001;23:507-15.