International Journal of Engineering Technology and Scientific Innovation

ISSN: 2456-1851

Volume: 08, Issue: 01 "January-February 2023"

COMPARATIVE CLINIC STUDY IN UPPER CANINE DISTALIZATION ASSISTED WITH PIEZOSICION AND THE CONVETIONAL METHOD

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DOI: https://doi.org/10.51193/IJETSI.2023.8101

ABSTARCT

The aim of this study was to compare the quantity of tooth movement in canine distalization, using the precision technique in the experimental group and the conventional method in the control group.

MATERIALS AND METHODS: twenty upper canines of ten patients were analyzed in a split-mouth design. They were distalized using an elastomeric chain applying a force of 250 grams per side. The teeth were divided randomly into two groups; the experimental group: 10 canines in which piezocision were applied; control group: 10 canines distalized with a conventional method. Patients were cited for measurements and changes of elastomeric chains every fourteen days on three occasions. Dental casts were taken at every appointment to calculate the distance of distalization.

RESULTS: distalization time in the experimental group decreased since the control group reported a mean of distalization of 0.97±0.32 mm while the experimental group had a mean of 2.01±0. 51mm.

CONCLUSIONS: Piezosicion-assisted distalization accelerates tooth movement, decreases loss of posterior anchorage, and is a minimally invasive procedure with a low post-operatory pain level.

Keywords: Malocclusion; Model; Piezocision; Piezosurgery; Rapid.

ISSN: 2456-1851

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INTRODUCTION

The number of adult patients requiring orthodontic treatment to improve their aesthetics or masticatory system is increasing. Aesthetics and time have become essential factors today in this society with such an accelerated pace of life. Orthodontic treatment in adolescent and adult patients is challenging, as they frequently require shorter treatments.

The average biological movement of a tooth is approximately 1mm over four weeks[(1)]. In patients with premolar extractions, canine distalization can take up to 7 months, leading to a total treatment time of up to two years.

Therefore, modalities that reduce treatment time without compromising treatment outcomes are currently an area of orthodontic research. Different surgical techniques have been developed to help speed up this process and thus shorten the treatment time, including piezocision[(2)].

The history of periodontally accelerated osteogenic orthodontic treatment (PAOO) dates back to the end of the 19th century[(3)]. Bryan first described accelerated orthodontic treatment. Later, Köle introduced a surgical procedure involving osteotomy and corticotomy to accelerate orthodontic movement based on the concept that "the tooth moves faster when the resistance that cortical bone opposes is decreased through a surgical act."

Today, the technique known as corticotomy-facilitated orthodontics is called selective alveolar decortication and was proposed by the Wilcko brothers when they described their own modification of the technique by patenting it under the name periodontally accelerated osteogenic orthodontics (PAOO)[(4)].

Following the course of the Wilcko[(4)] brothers, different authors have registered their versions of the procedure under different names.

Kim. Park and Kang[(5)] introduce a complementary surgical procedure to orthodontic treatment to accelerate tooth movement with minimal intervention. By not requiring lifting a mucoperiosteal flap, possible complications are avoided, such as resorption of the alveolar ridge, alveolar dehiscence, and gingival recession[(5)].

Aboul-Ela et al[(6)] clinically evaluated the retraction of maxillary canines with orthodontic treatment combined with corticotomies, and found that daily the average of canine retraction was significantly higher in the corticotomy group during the first two months after corticotomy.

Following the idea of Kim et al[(5)] piezocision occurs, technique described by Dibart, Sebaoun, and Surmenianen[(2)] Corticotomies are performed only in the vestibular cortex, longitudinally in the interproximal bone, preserving the interdental papilla.

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The aim of the study was to evaluate the amount of dental movement using the piezocision procedure in the distalization of maxillary canines in patients with maxillary first premolar extractions.

The principal advantage of this technique is the fast procedure, which is minimally invasive and less traumatic for the patient because it does not require a flap elevation. The cuts are only in the vestibular cortical with a piezoelectric scalpel for the preservation of soft tissues.

MATERIALS AND METHODS

In 2017 10 patients were selected for this study at the clinic of Master's Degree in Orthodontics at our university who had an extraction of upper first bicuspids part of orthodontic treatment, the age range of the patients was from 15 to 30 years old.

Twenty upper canines were divided into two groups: experimental group (n=10) and control group (n=10), randomly assigned to each side of the patient. A Goshgarian was placed at first molars for moderate anchorage. The experimental group underwent piezocision surgery under local anesthesia prior to canine distalization.

Fig. 1: Vertical gingival incisions were made in the interproximal area of the canine.

The piezotome ultrasonic instrument was used to perform the corticotomies through the microincisions in the gingiva at a depth of 3 mm.

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Fig. 2: The use of sutures in these microincisions was not necessary.

No special procedure was performed on the control group. Canines Distalization was started with a continuous elastic Polychain (STYLUS) using a force of 250 grams for each elastic chain. Patients were called every 14 days on three occasions to activate the chains again at 250 g and to get cast models that would help us to make the measurements necessary for the study.

Each dental cast was photographed by placing the camera on a standardized tripod at the same height. Reference points were traced on the study models and calibrated to obtain the actual measurements. The midpalatal raphe and specific palatal rugae appeared in the four cast models, also the cusps of the two canines (Fig 3).

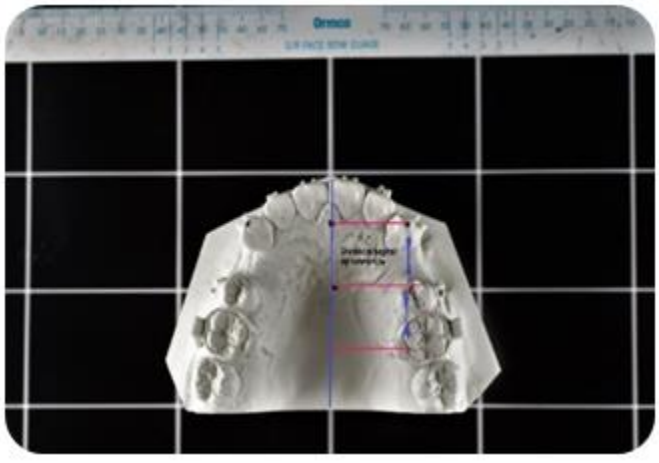

Fig. 3: Cusp of two canin.

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Subsequently, they were removed from the incubator to observe and measure the inhibition halo that was formed, the measurement of the halo was carried out with the help of a metal millimeter ruler.

RESULTS

The present study was carried out on ten patients at our university's clinic of Master's Degree in Orthodontics to evaluate the distalization of upper canines using the Piezocision method (Experimental Group) and the Conventional Method (Control Group).

Canine Distalization

When obtaining the descriptive statistics of the canine distalization variable, the control group reported a mean of 0.97±0.32mm and the experimental group 2.01±0.51mm, showing a significant association between the conventional method and the Piezocision method ($p<0.05$). (Table 1)

Table 1: Descriptive Statistics of canine distalization in the study groups.

Descriptive									
Group		Statisticals							P
		Mean	95% confidence interval for mean		Median	SD	Mínimum	Máximum	
			Min	Max					
Canine distalization /Total	Control	.97	.74	1.20	.99	.32	.50	1.62	*0.001*
	Experimental	2.01	1.65	2.37	2.05	.51	1.28	3.08	

The exploratory analysis of the canine distalization variable was carried out by obtaining centrality and variation statistics (Mean, I.C. for the mean at 95%, Median, Standard Deviation, Minimum, and Maximum) for both study groups in the different evaluation periods. (Table 2)

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Table 2: Descriptive analysis of the distalization response variable concerning the study groups.

Groups	Values		Canine Distalization 14 days	28 days	42 days	*p-value*
Control	Mean		.37	.33	.27	
	I.C. at 95% p/mean	Lím. Lower	.24	.25	.18	
		Lím. upper.	.49	.41	.36	
	Median		.33	.33	.23	*0.067*
	Estándar Deviation		.18	.11	.12	
	Mínimum		.15	.17	.12	
	Máximum		.80	.48	.55	
Experimental	Mean		.82	.63	.56	
	I.C al 95% p/mean	Lím. Lower	.58	.51	.43	
		Lím. upper.	1.06	.76	.68	
	Median		.73	.66	.55	*0.001*
	Estandar Deviation		.34	.17	.18	
	Mínimum		.42	.43	.34	
	Máximum		1.65	1.02	1.00	
p-value			*0.001*	*0.001*	*0.001*	

When paired comparisons were realized, only a significant difference was shown in the dental movement presented in the experimental group between 14 and 42 days (p=0.001).

As for the multiple independent comparisons, a statistically significant difference was observed between the groups at 14, 28, and 42 days ($p<0.05$).

Anchorage Loss

The anchorage loss reported in both study groups was compared, showing significant independence ($p>0.05$).

Table 3: Anchorage loss in the study groups.

Descriptives									
Group		Statisticals							P Value
		Mean	95% confidence interval for the mean		Median	Standard deviation	Mínimum	Maximum	
			Lower limit	Upper limit					
Loss of Anchorage/Total	Control	.75	.68	.82	.77	.10	.55	.88	*.161*
	Experimental	.82	.76	.87	.81	.08	.68	.93	

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Centrality and variation statistics for the anchor loss response variable were obtained for both study groups in the three periods analyzed. Later, paired comparisons were made regarding the loss of anchorage, not observing a statistically significant difference between the evaluation periods in any of the study groups ($p>0.05$).

Finally, anchorage loss was evaluated using the Mann-Whitney U statistical test, finding no significant difference between the Conventional Method and the Piezocision Method ($p>0.05$).

DISCUSSION

Piezocision allows safe corticotomies to be performed around the dental root; micro-invasive cuts are characterized by having maximum surgical control, selective cuts, a better preservation of root integrity, adequate bone regeneration, and less morbidity in healing. This technique is reliable, fast, and pain-free; for this reason, its application is highly recommended in conjunction with orthodontic treatment. In the current study, the regional acceleration process (RAP) was evaluated in teeth that underwent piezocision; RAP is a transient phenomenon; therefore, patients should be reviewed every two weeks during treatment. We agree with the work done by Aboul-Ela et al([6], who report distalization of 1.8 mm in 1 month when the interseptal bone reduction was performed before distalization, the results of this study are similar to ours, although piezocision is a less traumatic procedure and easier to perform compared to interseptal bone reduction. We also agree with Aksakalli et al[(8)] who report canine distalization of 1.53 mm per month when piezocision was performed before distalization. Regarding the loss of molar anchorage, we did not find a statistically significant difference between the control and experimental groups. The control group had an anchorage loss of .26 mm for their first 14-day control and .28mm for the experimental group. At the end of the study, both groups had similar anchorage loss results.

CONCLUSIONS

Under the conditions previously described in the study, the following conclusions were obtained:

- Statistically significant differences in distalization movement were observed using the piezocision technique compared to the conventional method after 14 and 28 days of the movement.
- At day 42, canine distalization decreased; nevertheless, significant values were shown compared to the conventional technique.
- There were no statistically significant differences in anchorage loss between the experimental and control groups.

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