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Comparison of periodontal changes during retraction using niti close coil spring and e-tie using CBCT.

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Abstract

Objective: This study is done to evaluate the periodontal condition and changes during the en-masse retraction using NiTi close coil spring and E-tie with a follow up of 3 months using CBCT.

Materials And Methods: Study comprised of 10 patients (6 females, 4 males) requiring 1^{st} premolar extraction in the upper arch within the age limit of 16-25 years.

Maxillary arch was divided into two as right and left quadrants in a 17*25 SS basal arch wire, the retraction was initiated after aligning and levelling using NiTi close coil spring and E-tie on the right and left side respectively with 200gms of force.

The pre and post records were taken using CBCT and the evaluated for the amount anchorage loss, amount of space closure, and amount of root resorption.

Result: The amount of anchorage loss seen in this studying NITI close coil spring is 2.15 ± 0.16 and E-tie is 4.13 ± 0.34 .

The amount of space closure in the study using the NiTi close coil spring with a force of 200g is 2.44 ± 0.20 and E-tie is 2.14 ± 0.14 .

The amount of root resorption of about 0.32 ± 0.13 in NITI close coil spring retraction method and 0.67 ± 0.17 in E-tie retraction method.

Conclusion: Usage of NiTi close coil spring is comparatively better and safer as it provides rapid space closure, lesser root resorption and anchorage loss than E-tie.

Keywords: CBCT, E-tie, en-masse canine retraction, NiTi close coil spring, root resorption, space closure.

Introduction

Orthodontic tooth movement is a process by which a mechanical force is applied to induce bone resorption on the pressure side and deposition on tension side.

The orthodontic treatment often requires extraction of premolars followed by retraction of canine into the extraction site.

Space closure can either be done by anterior retraction, posterior protraction or in combination. Anterior retraction can be done either by single step retraction (en-masse retraction) or two step retraction (individual canine retraction). Since two step retraction takes a long a duration, en-masse retraction has gained substantial popularity.

The space closure is carried out using NiTi close coil spring, E-chain, E-tie in PEA by using sliding mechanics. Nickel titanium coil spring provides light continuous force over varying lengths and duration.

They may be able to meet all the criteria for an ideal force delivery system.¹

Materials and Methods

The study comprised of 10 orthodontic patients (6 females and 4 males) requiring extraction of 1^{st} premolar for treatment, with an age limit of 16-25 years in the department of orthodontics and dentofacial orthopedics, in THAI MOOGAMBIGAI DENTAL COLLEGE, Chennai. The maxillary arch was split into two as left side and right side in 17*25 SS basal arch wire, the retraction was initiated after alignment and leveling using NiTi close coil spring on the right side and etie on the left side with a force of 200gms. The pre records and post records after 3months of retraction with activation every month was taken.

Prior to the study the approval was taken from the ethical committee and the study was explained in detail to patients and their consent was taken and from parents if the patient was minor.

Evaluation of Patients

Using CBCT patients were evaluated for Anchorage loss Extraction space closure Canine root resorption

Procedure

The patients was bonded with metal 0.022 slot MBT brackets (3M). After aligning and leveling with a basal arch wire 17*25 SS using crimpable hooks on both 1^{st} and 2^{nd} quadrant, given NITI close coil spring on the right side and E-tie on the left with a retraction force of 200gms which was activated every 30 days and records were taken pre retraction and 3months post retraction.

Reference Plane

Standard refrence plane was bizygomatic width which was intersected by a vertical line dropped from the ANS point.



Figure 1

Dr. Mythriyee.B.G, et al. International Journal of Dental Science and Innovative Research (IJDSIR)

Anchorage loss: The line from mesio buccal cusp of 1st molars to the standard landmark was drawn on either side and the line from ANS to standard landmark was drawn and the measurement between the lines were calculated pre and post 3 months



Fig.2: Pre distance-post distance=anchorage loss

Extraction space closure: The measurement was taken by a line drawn from the incisal tip of the canine to the standard landmark(bizygomatic width) on either sides and the line from ANS to standard landmark was drawn and the measurement between the lines were calculated pre and post 3 months.



Fig. 3: Post extraction space – pre extraction space = amount of space closed

Canine root resorption: The measurement was made from incisal tip to root tip of the canine on either side before retraction and 3months after retraction.



Fig. 4: Pre-Canine height – post canine height = canine root resorption



Fig.5: After Aligning and Levelling





Fig.6: Retraction



Figure A: Niti coil spring retraction method

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Dr. Mythriyee.B.G, et al. International Journal of Dental Science and Innovative Research (IJDSIR)



E-tie retraction method

Fig.7: Activation



Fig.8: Three Months After Retraction



Fig.: Niti close coil spring retraction method



Fig: E-tie retraction method Fig.9: Pre-Op and Post-Op CBCT





Amount of Space Closure





Page4.

Canine Root Resorption



Statistical Result

Statistical analysis of the data was done using Statistical Package for Social Sciences, IBM Corporation, SPSS Inc., Chicago, IL, USA version 21 software package (SPSS). Descriptive statistics including mean and standard deviation were computed for various clinical parameters. Normality of the data was assessed using Shapiro-Wilk test. Further analysis was done using non-parametric tests since the data did not follow a normal distribution. Mann – Whitney test was used to compare the mean rank differences between the groups. The level of significance in the present study was kept at p<0.05.

CBCT Evaluation

Evaluation of Anchorage Loss

Table1

Variable	Group	Ν	Mean	Mean	P-
				Rank	Value
Amount Of	Niti Close	10	2.15±0.16	5.50	0.000*
Anchorage Loss	Coil Spring				
	E-Tie	10	4.13±0.34	15.5	

*P-value 0.000 which shows high significance between the NITI close coil spring and E-tie in evaluation of

anchorage loss.

Mann-Whitney Test

Evaluation of Amount of Space Closure

Table2

Variable	Group	Ν	Mean	Mean	P-
				Rank	Value
Amount Of	Niti Close Coil	10	2.44±0.20	14.3	0.004*
Space Closure	Spring				
	E-Tie	10	2.14±0.14	6.7	

*P-value 0.004 which shows high significance between the NITI close coil spring and E-tie in evaluation of amount of space closure.

Mann-Whitney Test

Evaluation of Canine Root Resorption

Table3

Variable	Group	Ν	Mean	Mean	P-
				Rank	Value
Amount Of Canine	Niti Close	10	0.32±0.13	6.30	0.001*
Root Resorption	Coil Spring				
	E-Tie	10	0.67±0.17	14.70	

*P-value 0.001 which shows high significance between the NITI close coil spring and E-tie in amount of canine root resorption.

Mann-Whitney Test

Discussion

Anchorage loss is the amount of mesial movement of posterior teeth into the extraction site. Anchorage loss

depends on the number of factors like root surface area, root length, root configuration number of posterior teeth. Anchorage can be reinforced by adding more teeth in the posterior unit, adding auxillary like trans-palatal arch or nance palatal arch into the anchor unit. Recently anchorage can be reinforced by using orthodontic mini – screws in the posterior region which can be either used directly or indirectly for anchorage purpose. According to Silvia Geron et al⁴, there is no difference between the anchorage loss between the individual canine retraction and en masse retraction

Anchorage is a critical component in anterior en-masse retraction. According to 'Newton's Third Law' for every action there is an equal and opposite reaction⁵, failure to maintain the position of the anchorage units leads to 'anchor loss', which results in incomplete achievement of anterior retraction⁶. There is more amount of anchorage loss in non implant assisted retraction than in mini screw assisted retraction of anterior teeth. The amount of anchorage loss seen in this studying NITI close coil spring is 2.15 ± 0.16 and E-tie is 4.13 ± 0.34 .

En-masses retraction, where the canines and incisors are retracted together. Here, the method of anchorage is based on the types of tooth movement in the posterior and anterior segment and does not entirely depend on the number of teeth in each segment. The retraction force for en masse retraction should be kept minimum to provide more acceptable tooth movement. The use of light forces are more efficient and less painful. Increasing the amount of force results in tipping of teeth.⁷

Various auxillary are used for retraction in en masse like ligature ,e-chain ,e-tie and nickel titanium are the commonly used auxillary for en masse retraction. Using super elastic nickel titanium spring provides more rapid space closure.^{8,9}.En masse retraction is more acceptable since it is esthetically acceptable. The amount of space

Dr. Mythriyee.B.G, et al. International Journal of Dental Science and Innovative Research (IJDSIR)

closure in the study using the NiTi close coil spring with a force of 200g is 2.44 ± 0.20 and E-tie is 2.14 ± 0.14 .

Apical root resorption is an undesirable effect of orthodontic treatment¹⁰. To evaluate root resorption progress cone-beam computed tomography (CBCT) was used, and the study shows a slight amount of root resorption of about 0.32 ± 0.13 in NITI close coil spring retraction method and 0.67 ± 0.17 in E-tie retraction method.

Conclusion

- 1. The amount of anchorage loss seen in NITI close coil spring is comparatively lesser than the usage of E-tie.
- Rapid space closure was noted with usage of NITI close coil spring than E-tie.
- 3. Root resorption is seen less in NITI close coil spring than E-tie.

Hence usage of nickel titanium close coil spring provides light continuous force that is biologically safe with more rapid in space closure than E-tie which provides an intermittent force.¹¹

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