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Original Research

Analysis of canine retraction with active tie back and power chain- An *in vivo* study

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ABSTRACT:
Background: Orthodontic tooth movement is greatly influenced by the characteristics of the applied force, like its magnitude, direction, movement to force ratio and the physiologic health of the periodontal tissue of individual patient. The present study was conducted to compare canine retraction with active tieback and power chain. **Materials & Methods:** 32 patients aged 16 to 24 years of both genders requiring orthodontic treatment were treated with fixed orthodontic therapy using MBT prescription of 0.022 slot (A.O). Canine retraction was started with power chain on one side (Group I) and active tieback (Group II) on contralateral side using four micro-implants in the maxilla. Canine retraction was compared in both groups. **Results:** Out of 32 patients, males were 10 and females were 22. The mean canine retraction at 1 month in group I was 0.38 mm and in group II was 0.28 mm, at 2 months was 0.46 mm in group I and 0.39 mm in group II, at 3 months was 0.45 mm in group I and 0.41 mm in group II and at 4 months was 0.44 mm in group I and 0.40 mm in group II. The difference was significant (P< 0.05). **Conclusion:** Power chain exhibited faster rate of canine retraction as compared to active tie back.
Key words: Active tie back, Orthodontic, Power chain

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INTRODUCTION

Orthodontic tooth movement is greatly influenced by the characteristics of the applied force, like its magnitude, direction, movement to force ratio and the physiologic health of the periodontal tissue of individual patient.[1] The characteristics of the applied force also depend on the orthodontic appliance used.[2] In orthodontics, no consensus exists on how to move teeth most efficiently. An optimal approach should result in the highest possible rate of tooth movement without irreversible damage to the periodontal ligament, the alveolar bone or the root and minimal discomfort to the patients.[3]

There are different space closure (anterior retraction, posterior protraction, or combination) options which are available today in pre-adjusted mechanotherapy sliding mechanics for en masse retraction; has gained a substantial popularity after the evolution of MBT philosophy. In PEA using sliding mechanics the space closure is carried out nowadays with the help of either

E-chain, NiTi coil closing spring, or stretched modules with ligatures.[4] Nickel – Titanium coil springs have been shown to produce a constant force over varying lengths and duration, with no force decay. They may be able to meet all the criteria for an ideal force delivery system. In high anchorage cases, it's better to retract canines first and then go for incisors retractions. This reduces the load of anchorage unit.[5]

Clinical literature reports highly variable rates of canine retraction. Rate range from approximately 0.2-2.5 mm per month. The measurement of tooth movement is done by change in position of tooth or teeth relative to the reference point. Canines can be retracted individually or can be retracted along with the incisors. Retraction of the canines along with the anterior teeth as one unit is known as an en masse retraction.[6] The present study was conducted to compare canine retraction with active tieback and power chain.

MATERIALS & METHODS

The present study comprised of 32 patients aged 16 to 24 years of both genders requiring orthodontic treatment. All were enrolled when they agreed to participate in the study.

Demographic data such as name, age, gender etc. was recorded. All patients were treated with fixed orthodontic therapy using MBT prescription of 0.022 slot (A.O). Canine retraction was started with power chain on one side (Group I) and active tieback (Group II) on contralateral side using four micro-implants in the maxilla. Two micro-implant apical to the first molars (left and right) and one on each side of the mid-palatal suture, apical to the central incisors. Lateral cephalometric tracings before and during the treatment were superimposed by using the micro-implant as reference point and measurement was done for rate of retraction of canine for 4 months. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 32		
Gender	**Males**	**Females**
Number	10	22

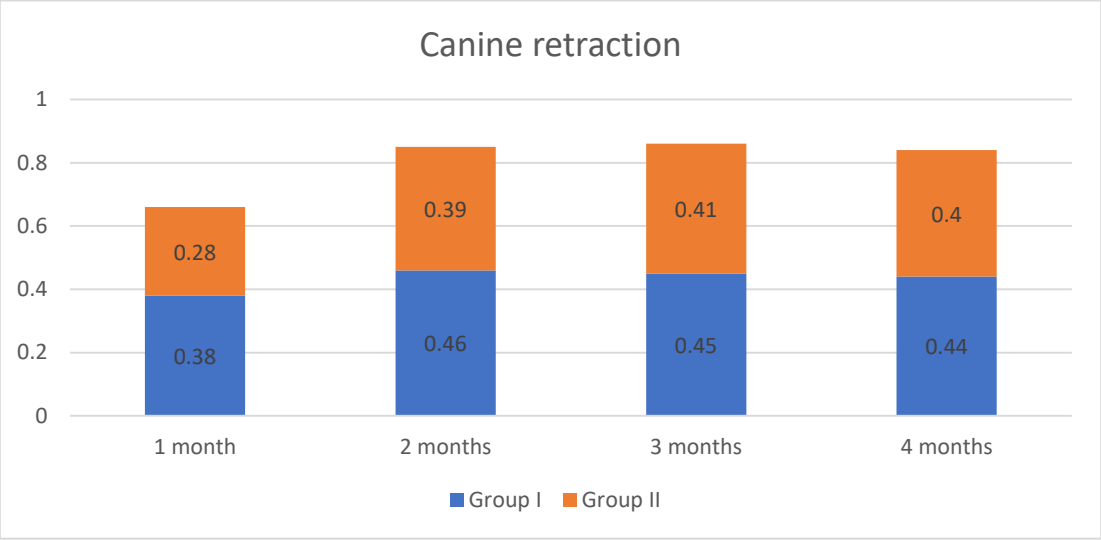
Table I shows that out of 32 patients, males were 10 and females were 22.

Table II Comparison of canine retraction at different intervals in both groups

Time intervals	Group I	Group II	P value
1 month	0.38	0.28	0.05
2 months	0.46	0.39	
3 months	0.45	0.41	
4 months	0.44	0.40	

Table II, graph I shows that mean canine retraction at 1 month in group I was 0.38 mm and in group II was 0.28 mm, at 2 months was 0.46 mm in group I and 0.39 mm in group II, at 3 months was 0.45 mm in group I and 0.41 mm in group II and at 4 months was 0.44 mm in group I and 0.40 mm in group II. The difference was significant (P< 0.05).

Graph I Comparison of canine retraction at different intervals in both groups



DISCUSSION

Orthodontic space closure has always been a challenge for the orthodontist. With the preadjusted appliance, sliding mechanics is the most preferred method of closing extraction spaces.[7] For this there are several methods of applying force like elastic modules, elastic chains, Niti coil spring, which provide a force of 100 to 200 grams.[8] It has been suggested that forces of approximately 150 gm may be the ideal physiologic force for bodily movement of the canines. Clinical literature reports highly variable rates of canine retraction. Rate range from approximately 0.2-2.5 mm per month.[9] The measurement of tooth movement is done by change in position of tooth or teeth relative to the reference point. Errors have been detected when the adjusted tooth or anatomically stable points are used as reference points because the movement of adjacent tooth and growth changes takes place in cranial structures.[10] Pre-adjusted fixed orthodontic appliances commonly utilize sliding mechanics for space closure with force delivery systems such as elastomeric chain, nickel titanium coil springs, elastomeric modules attached to wire ligatures, or intra-oral elastics. Synthetic elastomeric chain was introduced in the 1960s and has been in widespread use since. When a polymer is stretched and the stress within it increases proportionally to the applied strain, the polymer is described as behaving elastically. In such circumstances, the unloading curve of the resultant stress/strain graph is identical to the loading curve.[11] However, when elastomeric chain is stretched, it does not behave as a perfectly elastic material, because it loses energy and its unloading curve demonstrates less stress for a given stretch compared to the loading curve. This is called a hysteresis curve and is important because it is the unloading curve that is of interest to orthodontists. Indeed, it is well known that elastomeric systems.[12] The present study was conducted to compare canine retraction with active tieback and power chain.

In present study, out of 32 patients, males were 10 and females were 22. Mahobia et al[13] found that for active tieback mean rate of canine retraction was 0.36+0.03 mm per month and for power chain it was 0.44+0.02 mm per month. P value of < 0.001 showed that there was statistically difference between rates of retraction. Comparison of monthly rate of canine retraction between power chain and active tieback showed that there was statistically significant difference between first, second and third month, but at fourth month there was no statistically difference in rate of tooth movement.

We observed that mean canine retraction at 1 month in group I was 0.38 mm and in group II was 0.28 mm, at 2 months was 0.46 mm in group I and 0.39 mm in group II, at 3 months was 0.45 mm in group I and 0.41 mm in group II and at 4 months was 0.44 mm in group I and 0.40 mm in group II. Shankar et al[14] compared the rate of space closure by canine retraction between active-tie back and NiTi closed coil spring. The rate of canine retraction was faster with Ni- Ti Closed Coil Spring compared to the Active Tieback in the first and second months. In the third month the Active Tieback showed a faster rate of canine retraction than NiTi Closed Coil Spring.

Andrew L. Sonis[15] compared elastics vs NiTi coil springs for canine retraction, nickel titanium produced nearly twice as rapid a rate of tooth movement as conventional elastics rated at about the same force level. This discrepancy is probable due to two factors: the ability of the springs to maintain a relatively constant force level compared to the elastics, and the elimination of the need for patient cooperation.

CONCLUSION

Authors found that power chain exhibited faster rate of canine retraction as compared to active tie back.

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