Research Article

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Comparison of Rate of Canine Retraction Between T-LOOP and PG Spring in Orthodontic Treatment

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ABSTRACT

Background: Canine retraction is a very important step in treatment of patients with crowding, or first premolar extraction cases. Correct positioning of the canines after retraction is of great importance for the function, stability, and esthetics. The aim of the present study was conducted to compare the rate of canine retraction between T-loop and PG spring in orthodontic treatment.

Material and methods: This were a single-center, split-mouth, simple randomized trial. In the present study total participants selected for the study were 40 patients divided into two groups. Group A was T-loop spring (right side of the upper arch) and Group B was PG spring (left side of the upper arch). Following extraction of first premolars, initial leveling was performed with the preadjusted edgewise appliance. After leveling and alignment, retraction of canine using either TL or PG spring was done. Outcomes were evaluated cephalometrically and using model analysis. The subjective assessment of pain and discomfort for both T-loop and PG spring was done using visual analog scale (VAS). All the statistical analyses were performed using SPSS statistical package (version 22.0, SPSS Inc., Chicago, Illinois, USA). $P < 0.05$ was considered as the level of significance.

Results: In the present study total participants selected for the study were 40 patients divided into two groups. Group A was T-loop spring (right side of the upper arch) and Group B was PG spring (left side of the upper arch). The mean amount and rate of retraction of the canine were found to be higher for the PG spring when compared with T-Loop spring. Anchorage loss was also found to be significantly higher for PG spring when compared with T-Loop Spring. The amount of canine tipping for PG Spring was 6.567° ±2.543°, while that for T-Loop Spring was 1.324° ± 4.535°. Distopalatal rotation of the canine tooth was significantly higher for T-Loop Spring when compared with PG-spring. The VAS scores were 29.64 for PG spring and 48.76 for T-loop. P value found to be statistically highly significant ($P < 0.001$).

Conclusion: Our study concluded that PG spring shows increased rate of retraction and rotation control when compared with T-Loop Spring. The amount of tipping and anchorage loss obtained with PG spring were significantly higher than T-Loop spring. Patient comfort was better for PG spring.

Keywords: T-loop, PG spring, canine retraction.

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INTRODUCTION

Closure of extraction spaces is an integral part of many orthodontic treatment plans. In goal-oriented orthodontics, the closure of these spaces requires an understanding of the mechanical systems used. Space closure can be achieved by either friction (sliding) mechanics or frictionless (loop) mechanics.[1] The PG universal retraction spring was introduced by Poul Gjessing of Denmark in 1985. It is made from 0.016" x 0.022" stainless steel wire. It is designed for controlled retraction of either canines or upper incisors. No clinical alterations of the spring is needed and force system produced is independent of inter bracket distance. The Disadvantages of PG springs are that it is bulky and the depth of the buccal sulcus limits the height of the pear. [2] The T-loop design for orthodontic space closure has been comprehensively studied, particularly loops made from titanium–molybdenum alloy (TMA).[3] It is a composite TMA 0.018"-0.017" x 0.025" retraction spring. A 0.018" round T spring is welded directly to a 0.017" x 0.025" base arch. The basic element of the spring is a prefabricated highly standardized universal spring, which could be used on both the right and left sides. These prefabricated versions have to be preactivated as per a prescribed template.[4] The aim of the present study was conducted to compare the rate of canine retraction between T-loop and PG spring in orthodontic treatment.

MATERIAL AND METHODS

This was a single-center, split-mouth, simple randomized trial. In the present study total participants selected for the study were 40 patients divided into two groups. Group A was T-loop spring (right side of the upper arch) and Group B was PG spring (left side of the upper arch). Before the commencement of the study ethical approval was taken from the Ethical Committee of the institute and informed consent was obtained from the patient. Patient involving bilateral extractions of maxillary first premolars in the age group of 13–20 years with the canines well-aligned within the arch, mild crowding of <5 mm, and presence of all teeth upto second molars were included in the study. Following extraction of first premolars, initial leveling was performed with the preadjusted edgewise appliance (MBT prescription, 0.022 × 0.028" slot). Initial leveling and alignment commenced with 0.014" round NiTi wire in all cases and progressed according to common MBT treatment sequence, to 0.019 × 0.025" rectangular stainless steel wire, which was left *in situ* for at least 4 weeks to ensure full expression. After leveling and alignment, the molars and premolars were held as a segment by a 0.019 × 0.025" stainless steel wire and tied with stainless steel ligatures, ready for retraction of canine using either TL or PG spring. Study models and lateral cephalograms using radiopaque TMA wire markers to differentiate right and left sides were obtained. In 50% of patients, the right side was treated with T-loop spring and the left side with PG spring. The retraction was started at the same time on both the sides. All the springs were constructed with 0.017 × 0.025" TMA wire (Ormco Corp, Orange, CA, USA). After onset of retraction, all patients were recalled every 6 weeks to ensure the amount of activation for three visits. Both T-Loop and PG spring were activated to give a consistent 150 g deactivation force during each of the three visits. Evaluation was again done using study models and cephalometric radiographs after completion of 18 weeks. Outcomes were evaluated cephalometrically and using model analysis. The primary outcome assessed was the rate of canine retraction. Rotation of the canines, changes in first molar position, and pain or discomfort experienced by the patient served as the secondary outcomes. The subjective assessment of pain and discomfort for both T-loop and PG spring was done using visual analog scale (VAS). The patients were thoroughly instructed regarding implications of the VAS. Written instructions were also given to them. Patients were called on their mobile/landline phones after 24, 48, and 96 h following initial placement and scores obtained. Such evaluation was done after initial placement, 6, 12, and 18 weeks. All the statistical analyses were performed using SPSS statistical package (version 22.0, SPSS Inc., Chicago, Illinois, USA). The analyses performed were paired *t*-test to quantify the changes before and after treatment within each group and independent *t*-test to compare the treatment changes in T-loop with PG spring. $P < 0.05$ was considered as the level of significance.

RESULTS

In the present study total participants selected for the study were 40 patients divided into two groups. Group A was T-loop spring (right side of the upper arch) and Group B was PG spring (left side of the upper arch). The mean amount and rate of retraction of the canine were found to be higher for the PG spring when compared with T-Loop spring. Anchorage loss was also found to be significantly higher for
were 29.64 for PG spring and 48.76 for T-loop. P value found to be statistically highly significant ($P < 0.001$).

Table 1: Comparison of change in canine position between T-loop ad PG springs.

Parameters	T-loop spring		PG spring		P-value
	Mean	SD	Mean	SD	
Amount of retraction	2.576	0.558	3.694	0.725	< 0.05
Rate of retraction	0.787	0.236	1.575	0.254	
Anchorage loss	0.244	0.556	0.786	0.175	
Tipping	1.324	4.535	6.567	2.543	
Rotation	4.653	2.540	2.598	1.964	

Table 2: Comparison of VAS score between T-loop ad PG springs.

Parameters	T-loop spring		PG spring		P-value
	Mean	SD	Mean	SD	
VAS score	48.76	8.56	29.64	6.72	< 0.05

DISCUSSION

Orthodontic therapy, including fixed appliances with continuous archwires and sliding mechanics, has the following disadvantages: lack of force control due to friction between bracket and archwire, and lack of vertical control. The multi-plicity of actions and reactions between archwire and brackets makes the system indeterminant.[5,6] The segmented technique has been designed in an attempt to overcome these disadvantages. This biomechanical system allows for two points of force application and calculation of a force system to accomplish the required displacement of the segments. Furthermore, the system can be monitored in such a way as to avoid friction, so That a very precise loading of the segments is effected.[5]

In the present study total participants selected for the study were 40 patients divided into two groups. Group A was T-loop spring (right side of the upper arch) and Group B was PG spring (left side of the upper arch). The mean amount and rate of retraction of the canine were found to be higher for the PG spring when compared with T-Loop spring. Anchorage loss was also found to be significantly higher for PG spring when compared with T-Loop Spring. T
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Previous studies on the paul gjessing (PG) spring have reported wide variations in canine retraction ranging from 1.91 ± 0.41 to 0.85 ± 0.41 mm/month.[7,8]

For canine tipping, a value of 3.33 ± 6.89 for the PG spring, 4.46 ± 6.38 for the T loop, 5.41 ± 6.38 for reverse closing loop, and 7.89 ± 2.32 for the Ricketts canine retraction spring has been reported.[8-10]

A study by Renato Parsekian on anchorage loss found that anchorage loss for T-loop was 1.0 ± 0.6. 10.[11] Dincer and Iscan HN found anchorage loss of 1.63 ± 1.11 for PG spring and 2.46 ± 1.5 for reverse closing loop).[8]

Elastic chain compared with Paul Gjessing retraction spring and Rickett's retraction spring compared with NiTi coil spring proved that there was no considerable difference in rates of canine retraction.[12]

CONCLUSION

Our study concluded that PG spring shows increased rate of retraction and rotation control when compared with T-Loop Spring. The amount of tipping and anchorage loss obtained with PG spring were significantly higher than T-Loop spring. Patient comfort was better for PG spring.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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