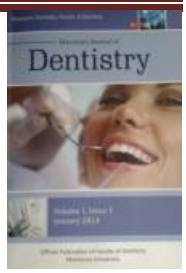
Evaluation of Maxillary Canine Retraction with Remaloy Cuspid Retraction Spring



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Abstract:
Objectives: To evaluate the efficiency of Remaloy cuspid retraction spring as a means of canine retraction.
Methods: The sample was consisted of 14 female patients with age ranged from 14 to 18 years. Canine retraction was done by Remaloy canine retraction springs. For all patients the following records were made: Photographs, Upper and lower plaster casts and Radiographs. The measurements were performed using casts and lateral cephalometric radiographs taken before and after canine retraction. The collected data were analyzed statically using t-test.
Results: The upper canines were retracted significantly with Remaloy cuspid retraction spring with rate 2 ± 0.17mm/m. There was a significant difference between pre and post retraction rotation angle about 22.86 ± 2.14˚. The upper canine tipping was signi ficantly increased with Remaloy cuspid retraction spring about 6 ± 1.57˚.
Conclusions: The Remaloy cuspid retraction spring is effective method for canine retraction. However, the canine tipping and rotation need to decrease by increase the antitipping and antirotation angles or decrease the force utilized.

Keywords: *Canine retraction; Remaloy cuspid retraction spring.*

Introduction

Canine retraction is one of the fundamental stages in considerable number of cases especially with crowding or for correction of large overjet. Position of the canine after retraction is importance for function, stability and esthetics [1]. Canines can be retracted either by friction (sliding mechanics) or frictionless mechanics (loop mechanics). In sliding mechanics, the wire and position of the bracket control the tooth movement, whereas in a loop spring system, control is built into the spring [2].

Several frictionless mechanisms were introduced for retraction of canine which includes: Ricketts canine retractor [3], vertical canine retractor spring [4], Burstone T-loop [5], PG canine Retraction spring [6], Ni-Ti canine retraction spring [7], Remaloy cuspid retraction spring [8]…etc. Remaloy cuspid retraction spring was introduced by Ladanyi [8]. It was constructed from 0.016 x0.016 inch Elgiloy Blue wire. The spring design was said to deliver 90 gm of force per millimeter of activation. He mentioned that the advantages of Remaloy cuspid retraction spring was gentle, long acting even traction by the combination of loop and spiral spring action. Insufficient researches about Remaloy cuspid retraction spring regarding their effect were published. The aim of the study was to evaluate the efficiency of Remaloy cuspid retraction spring as a means of canine retraction.

Patients and methods

The sample was consisted of 14 female patients with a mean age of 16 years and 1 month. They were selected from the Orthodontic Department, Faculty of Dentistry, Mansuora University according to the following criteria: Age ranged from 14 to 18 years, Had erupted permanent canines, Patients required bilateral maxillary first premolar extraction.

For each patient metal brackets, 0.22 inch slot, Roth prescription (3M-Minnesota-United States) were bonded to the corresponding teeth using a light cure adhesive material (3M-Minnesota-United States). The alignment and leveling of the posterior segment started with 0.014 inch Nitinol arch wires and ended with 0.018 inch stainless steel arch wires. Canine retraction was done by Remaloy cuspid retraction springs (Fig. 1) on the left side. A force level of 150 gm was used. For all patients the following records were made pre and post canine retraction: casts and Lateral cephalometric radiographs.

The amount of canine retraction and canine rotation were measured from dental casts [9]. On the other hand, canine tipping was measured from lateral cephalgram [9]. The rate of canine retraction was calculated as the amount of canine retraction in mm divided by retraction duration. The linear distance from CL1.CL2 and CR1.CR2 were measured (Fig. 2).

Determination of canine rotation was done by drawn lines joining mesial and distal contact point of canine. The angle between this line and the midpalatine raphe was measured (Fig. 3). Difference between pre and post retraction gives the actual amount of canine rotation.

The amount of canine tipping was measured with reference to the palatal plane (ANS-PNS) (Fig. 4). To identify left and right canines L shape reference bars were fabricated for each canine. They were made from 0.021×" 0.025" stainless steel wire with length 5 mm for the left and 10 mm for the right side.The amount of canine tipping was calculated by the difference in degree of tip between the marker in the pre-retraction and post-retraction cephalogram.

Results

Mean and Standard Deviation were estimated for different variables. Also, mean values were compared using paired t-

test and presented in Table 1. In the present study, $p \leq 0.05$ was considered as the level of significance. The mean rate of canine retraction with Remaloy spring was 1.39 ± 0.79 mm/m. The mean distance of retraction was 4.01 ± 1.41 mm and the mean duration of retraction was 2 ± 0.68 m. The difference between the pre and post canine retraction rotation angle was statistically significant ($P<.05$). The maxillary canines were rotated disto-lingually about 22.86 ± 2.14˚. The canines were significantly ($P<.05$) tippid distally with Remaloy springs. The mean canine tipping was 6 ± 1.57˚.

Discussion

Canine retraction is a common treatment procedure in orthodontics. Canines can be retracted either by friction or frictionless mechanics. The frictionless mechanics have the following advantages: absence of friction between the bracket and the wire, decrease retraction duration, provide space for unraveling the crowding without proclining the anterior teeth, minimal side effect on anchorage unit and provide more controlled tipping [10].

The present study was conducted to evaluate the efficiency of Remaloy cuspid retraction spring as a means of frictionless mechanics in maxillary canine retraction. The selection of this spring was based on the limited and insufficient information available to our extent in the literature about them. To avoid bias in results of the study many factors were considered. Among this factors the inclusion and exclusion criteria which applied to all patients, age and sex of the patients, retraction force applied and intra-examiner error of the method.

The age of the patients was selected to be in harmony because orthodontic tooth movement is affects by the age of the patient. This is supported by Watanabe and Miyamoto[7] who found that the rate of canine retraction by Niti canine retraction spring was faster in younger than adult.

Regarding the sex of the patients the sample was consisted of female patients only to avoid the different hormonal sex effect. The sex effect was reported by Dudic et al. [11]. who found that the rate of tooth movement was affected by many factors among them the sex of the patient.

Another important factor was the use of the same force level for both appliances which measured by force gauge where the force applied affect the rate of tooth movement as reported by Gonzales et al. [12] Optimal force in orthodontic known to produce excellent biological response with minimal tissue damage, resulting in rapid tooth movement with little discomfort, minimizing or avoiding hyalinized areas [13]. However, the magnitude and duration of the ideal force remain controversial [14]. Following most of the authors such as Reitan [15], Story and Smith [16], Huffman and Way [17], Quinn and Yoshikawa [18], Lotzof et al. [19] and lee [20] and their recommendations, the force of 150 gm was employed in this study.

The intra-examiner error of the method was estimated by taken each measurement twice and the mean of the two values was recorded. On the other hand, the statistically t-test was performed for pre retraction measurements of both groups to ensure that they were homogenous.

The result of the present study revealed that the maxillary canines were retracted with Remaloy retractors about 4.01 ± 1.4 mm in 2 ± 0.68 months with rate 2 ± 0.17 mm/month. This high rate may contributes to the presence of NiTi coil spring in the Remaloy canine retractors which have low load deflection rate with ability to maintain constant force levels during retraction. The reported rate of canine retraction in our study was in harmony with those of Ziegler and Ingervall [21] who studied the effect of PG canine retractor, Noda et al. [22] who used ratched bracket and Hayashi et al. [23] who studied the effect of Ricketts retractors. On the other hand, our result was faster than that of keng et al. [24] who used NiTi T-loop (0.91mm/month) and TMA T-loop (0.87mm/month) and Watanabe and Miyamoto [7] who used NiTi canine spring (0.62mm/month). This could be contributed to the different designs of the appliances used (shape, wire material and wire cross section), the different samples and different force utilized. Also, the result was faster than those of Daskalogiannakis and Mclachlan [25] who use magnet (1.22mm/month) and Darendeilier et al. [26] (1.64mm/month) who used drum spring which produce constant force. This could be related to the lesser force used with magnet and drum spring than the force used in our results.

The present study declared that the rotation angle change for canines retracted by Remaloy canine retractors was 22.86 ± 2.14˚ which indicates that the crown significantly rotated disto-lingualy. This revealed that we need to increase the anti rotation bend or decrease the force utilized to produce more translation movement. This result was in line with Hayashi et al. [23] although he used higher antirotation angle (45˚) than those used in our study (10˚). This could be contributes to the use of higher force level in our study. Also the result was disagreement with those of Mehta and Sable [27] and Ziegler and Ingervall [21] and Rhee et al. [28]. This could be contributed to the different designs of the appliances used (shape, wire material and wire cross section), different samples, different force utilized and different antirotation angles.

The maxillary canines were significantly tippid distaly with Remaloy canine retractors where the tipping angle change was 6 ± 1.57˚. The results of the change in the canine tipping angles for both appliances were revealed that we need to increase the antitipping angle which increase the M/F ratio or decrease the amount of force utilized to obtain more translatory movement.

A similar finding was observed by Hayashi et al. [23] who found that the canine tipping with Ricketts retractor was 7.89˚/2 month.This could be explained by the placement of the same antitipping angle. Also, the result was in harmony with Rhee et al. [28] (6.23˚).

In the clinical work we found that Remaloy canine retractors were more hygienic than Ricketts canine retractors. This may contribute to the complex design of Ricketts canine retractors with more helix. Also, Ricketts retractor is more extended occlusally which make interference with brackets in the lower premolar teeth.

Conclusion

- The Remaloy cuspid spring was effective means in canine retraction.
- There was a significant canine rotation with Remaloy cuspid spring.
- All of the canines were retracted with a significant distal tipping of the crowns into the extraction spaces.

Table 1: The amount of distal movement, duration of retraction, rate of retraction tipping and rotation of canine during retraction with Remaloy cuspid retraction spring.

Three dimensional tooth movement	Mean ± SD
Distal movement of canine crown tip (mm)	4.01 ± 1.41
Duration of retraction (m)	2 ± 0.68
Rate of retraction (mm/m)	2 ± 0.17
Rotation of the canine (degree)	22.86 ± 2.14
Tipping of the canine	6 ± 1.57

Figure.1: Remaloy cuspid retraction spring.

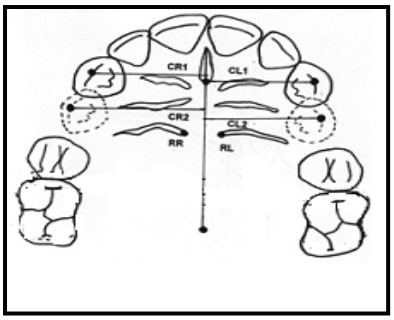

Figure 2: The amount of canine retraction.

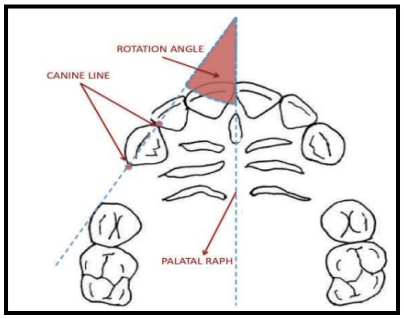

Figure 3: The upper canine rotation angle.

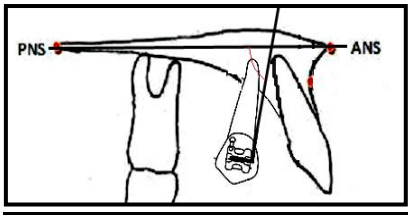

Figure 4: The upper canine tipping angle.

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