CHAPTER 3

RESULTS

This study was designed to determine the biochemical (IL-1β and IL-8) effect between using nickel-titanium closed coil spring (NT) and elastic c-chain (CH) for canine retraction. Twenty healthy young adults (6 men and 14 women) with mean 18.5 years of age needed orthodontic treatment with maxillary first premolar extraction. NT and CH were used for maxillary canine retraction for each side in each patient. A new CH was monthly replaced while the NT was not changed. GCF was collected from the distal side (pressure side) of the upper canines before bracket placement (pre-tx), before canine retraction (0h), after canine retraction 24 hours (24h), 1 month (1mo) and 2 months (2 mo) respectively. IL-1β and IL-8 levels were assessed using the ELISA method. The levels of two mediators before bracket placement were used as control and before canine retraction were used as baseline level. In addition, the amount of canine movement was measured in the study models.

All 20 participants had good oral hygiene throughout the study. There were not inflammatory clinical signs of gingival and periodontal status. No significant changes in plaque index and gingival index were found at any time. Additionally, the GCF from pressure side was collected five times and measured the absorbed volume at any time. Therefore, the sum of GCF samples was 100 samples in each NT and CH group. Table 1 showed the mean ± SD of GCF volume at each five time. The mean of GCF volume in NT group was 0.489 ± 0.229 μl and in CH group was 0.535 ± 0.213 μl.

Commercial IL-1β and IL-8 ELISA kits were used to quantify the level of IL-1β and IL-8 in the GCF samples. The levels (pg/ml) of IL-1β and IL-8 were calculated according to the reference calibration using standard curves. Then the GCF volume of each sample was used to divide the level of IL-1β and IL-8 for the total concentration (pg/μl) of IL-1β and IL-8 in the sample. In this study, the levels of IL-1β and IL-8 were evaluated at five times, pre-tx, 0h, 24h, 1mo and 2 mo, to measure the biochemical effect between using NiTi closed coil spring and elastic c-chain on mean IL-1β and IL-8 levels.

Table 1. Gingival crevicular fluid volume at pressure sides of maxillary canines (μl)

Material	Statistics	Control	Baseline	24 h	1 mo	2 mo
NiTi spring	Mean	0.437	0.482	0.581	0.532	0.414
	SD	0.224	0.212	0.271	0.262	0.178
C-chain	Mean	0.439	0.468	0.60	0.625	0.547
	SD	0.193	0.202	0.239	0.208	0.221

From the IL-1β assay, the concentrations (pg/μl) of IL-1β from pressure sides of maxillary canine at pre-tx, 0h, 24h, 1mo and 2 mo were illustrated by Table 2. In the comparison of IL-1β levels between groups (NT & CH), the IL-1β levels of NT group were significant higher than of CH group at any time (p<0.001). In the comparison of IL-1β level during orthodontic tooth movement, the control level (before bracket placement) of IL-1β was 0.0044± 0.0039 pg/μl in NT group and was 0.0043±0.0044 pg/μl in CH group. It was not significant difference (p=0.786). The baseline level (before canine retraction) of IL-1β was 0.0085±0.0038 pg/μl in NT group and 0.0089±0.0048 pg/μl in CH group. It was not significant different between group (p=0.595). We found that the IL-1β level was slightly elevated before canine retraction. After canine retraction, the levels of IL-1β were significantly increased and were highest at the 24th hour in both NT and CH groups (p<0.001). They were 0.0412±0.0089 pg/μl for NT group and 0.0252±0.0085 pg/μl for CH group. Moreover, the IL-1β level after 1 month of canine retraction was 0.0277±0.0114 pg/μl and was 0.0255±0.0089 pg/μl after 2 months of canine retraction in NT group. The result showed that the level of IL-1β in NT group was decreased after 24 hours of canine retraction but it was still higher than the baseline level (0.0085±0.0038 pg/μl) after one month and two months of canine retraction. While the IL-1β level at the first month of canine retraction was 0.0116±0.0052 pg/μl and was 0.0115±0.0051 pg/μl at the second month of canine retraction in CH group. This result showed that the IL-1β level in CH group was decreased after 24 hours of canine retraction and was decreased to the baseline level (0.0089±0.0048 pg/μl) within one month of canine retraction (Fig.26).

Table 2. Concentration of interleukin-1β at pressure sides of maxillary canines (pg/µl)

Material	Statistics	Control	Baseline	24 h	1 mo	2 mo
NiTi spring	Mean	0.0044	0.0085	0.0412	0.0277	0.0255
	SD	0.0039	0.0038	0.0089	0.0114	0.0089
C-chain	Mean	0.0043	0.0089	0.0252	0.0116	0.0115
	SD	0.0044	0.0048	0.0085	0.0052	0.0051

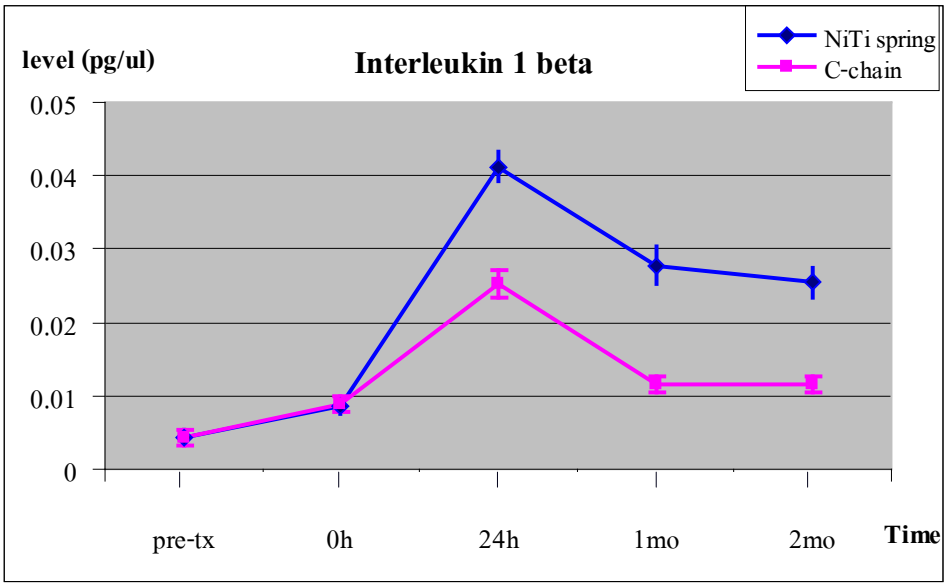

Fig.26: The levels of interleukin-1β at any time

From IL-8 assay, table 3 showed the concentration (pg/µl) of IL-8 at pressure sides of maxillary canines at pre-tx, 0h, 24h, 1mo and 2 mo. In the comparison of IL-8 levels between groups (NT & CH), the levels of IL-8 in NT group were significant higher than in CH group at any time (p<0.001). In the comparison of IL-8 level during orthodontic tooth movement, we found that the control level (before bracket placement) of IL-8 was 0.0354±0.0267 pg/µl in

NT group and was 0.0338±0.0218 pg/µl in CH group. It was not significant difference (p=0.719). In addition, the baseline level (before canine retraction) of IL-8 was 0.0536±0.0291 pg/µl in NT group and was 0.0559±0.0394 pg/µl in CH group. It was not significant different between group (p=0.721). After canine retraction, the levels of IL-8 were significantly increased and were highest at 24 hours in both NT and CH groups (p<0.001). They were 0.3316±0.1601 pg/µl in NT group and 0.2173±0.1153 pg/µl in CH group. Besides, the IL-8 level after one month of canine retraction was 0.1808±0.1161 pg/µl and was 0.1619±0.0761 pg/µl after two months of canine retraction in NT group. The result showed that the level of IL-8 in NT group was decreased after 24 hours of canine retraction but it was still higher than the baseline level (0.0536±0.0291 pg/µl) after one month and two months of canine retraction. In CH group, the IL-8 level at the first month of canine retraction was 0.0924±0.0676 pg/µl and was 0.0733±0.0402 pg/µl at the second month of canine retraction. This result indicated that the IL-8 level in CH group was decreased after 24 hours of canine retraction and was decreased to the baseline level (0.0559±0.0394 pg/µl) within one month of canine retraction (Fig.27). The result patterns of IL-1β and IL-8 levels in this study were similar but the IL-8 level was higher than the IL-1β level.

Table 3. Concentration of interleukin 8 at pressure sides of maxillary canines (pg/µl)

Material	Statistics	Control	Baseline	24 h	1 mo	2 mo
NiTi spring	Mean	0.0354	0.0536	0.3316	0.1808	0.1619
	SD	0.0267	0.0291	0.1601	0.1161	0.0761
C-chain	Mean	0.0338	0.0559	0.2173	0.0924	0.0733
	SD	0.0218	0.0394	0.1153	0.0676	0.0402

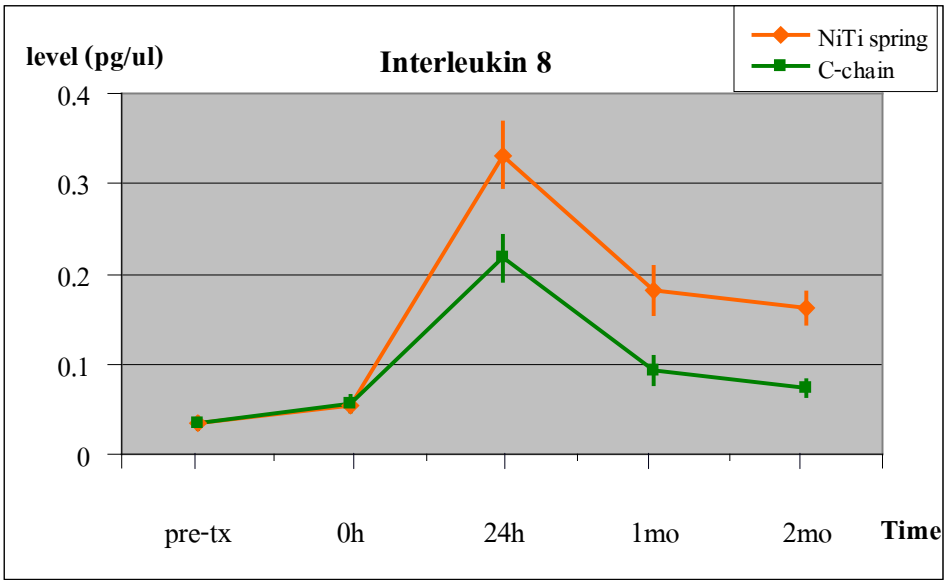

Fig.27: The levels of interleukin-8 at any time

Moreover, the amount of canine movement was measured in the study models using the 3rd rugae as the reference point. We found that the rate of maxillary canine retraction in NT group was significant higher than in CH group (p<0.001). The mean rate of space closure was 1.03 ± 0.29 mm/month for NT group and was 0.67 ± 0.28 mm/month for CH group (Table 4 and Fig.28).

Table 4. The rate of maxillary canine retraction in NT group and CH group (mm/month)

Material	The rate of maxillary canine retraction (mm/month)
NiTi spring	1.03 ± 0.29
C-chain	0.67 ± 0.28

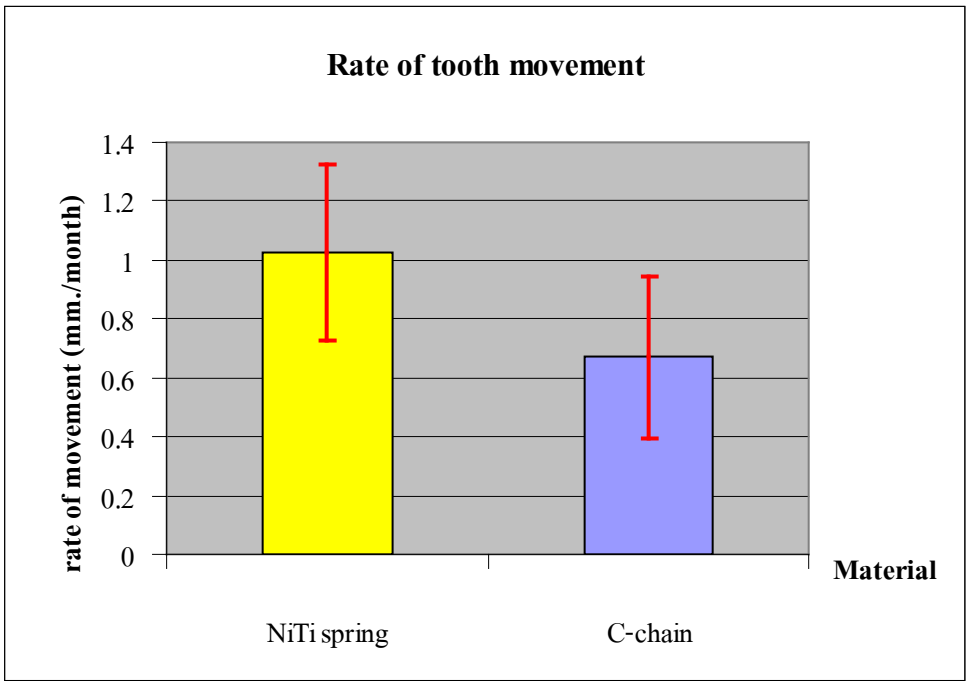

Fig.28: Graph shows the rate of maxillary canine retraction in NT group and CH group. Significant difference was found between NT group and CH group (p<0.001).