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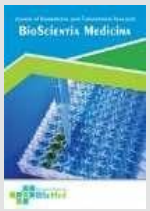

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Comparison of Pain Intensity in Canine Removal Using Closed Coil Spring Niti, Open Coil Spring Niti, Elastomeric Chain Short, Elastomeric Chain Long in Edgewise Standard Fixed Orthodontic Treatment

Oryce Zahara[1*], Endah Mardiati[2], Nila Kasuma[3], Fuccy Utamy Syafitri[1]

[1]Department of Orthodontics, Faculty of Dentistry, Universitas Andalas, Padang, Indonesia

[2]Department of Orthodontics, Faculty of Dentistry, Universitas Padjadjaran, Bandung, Indonesia

[3]Department of Oral Biology, Faculty of Dentistry, Universitas Andalas, Padang, Indonesia

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***Corresponding author:**
Oryce Zahara

E-mail address:
orycez@yahoo.com

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A B S T R A C T

Background: Every canine is pulled during fixed orthodontic treatment, whether using an elastomeric chain short, elastomeric chain long, closed coil spring, or open coil spring, tends to cause pain for the patient. Which of the four components of the active device is the best in terms of the pain effect felt by the patient. Pain is a symptom that underlies most patients' rejection of proposed treatment plans. The success of treatment cannot be separated from factors of relief of pain in general, and failure to address these factors may leave patients fearful of returning. This study aimed to compare pain intensity during canine extraction using closed coil spring niTi, open coil spring niTi, elastomeric chain short, and elastomeric chain long in fixed orthodontic treatment standard edgewise. **Methods:** This study is a longitudinal experimental research. A total of 16 research subjects participated in this study. The data analysis technique for this research is pain intensity analysis based on the time when the canine tooth is retracted using a tool elastomeric chain short, elastomeric chain long, closed coil spring, open coil spring, using the VAS questionnaire on the 1st, 3rd, and 7th days using non-parametric Kruskal Wallis statistical tests to find out whether there are significant differences between 3 different times on 4 different types of equipment. **Results:** There is no difference in intensity pain after canine retraction using closed coil spring, open coil spring, elastomeric chain short, or elastomeric chain long devices in standard edgewise fixed treatment based on VAS on the 1st, 3rd, and 7th days. There is no difference in intensity pain after canine retraction using a closed coil spring appliance in standard edgewise fixed treatment based on VAS on the 1st, 3rd, and 7th days. There are differences in the intensity of pain after retraction of the canine tooth using an elastomeric chain short, elastomeric chain long appliance in standard edgewise fixed treatment based on VAS on the 1st and 3rd days. **Conclusion:** There are differences in pain intensity during canine extraction using closed coil spring niTi, open coil spring niTi, elastomeric chain short, and elastomeric chain long in fixed orthodontic treatment standard edgewise.

1. Introduction

Orthodontic treatment is one of the treatments carried out in the field of dentistry, which aims to achieve an aesthetic dentofacial appearance by eliminating the crowding of teeth, correcting deviations in rotation, correcting the relationship between incisors, and creating a good occlusion relationship. Tooth movement is the basis of orthodontic treatment, which aims to return abnormal teeth to their normal occlusion position. Canine tooth retraction is a space closure that is commonly carried out in cases with extraction. The coil spring and elastomeric chain function to generate force in tooth movement. There are advantages and disadvantages to

coil springs and elastomeric chains. The coil springs have the advantage of an active period of more than 60 days, do not absorb saliva, and are made from NiTi material, so their elasticity is more durable, the force applied is more constant, closes the room faster than elastomeric chains. Disadvantages of coil springs include that they are expensive, sometimes coil springs can cause food retention and bother oral mucosa, as well as the action and reaction forces that are generated. Elastomeric chains have advantages, including not causing food retention, relatively constant movement of teeth, and relatively cheap price. The disadvantages include absorbing saliva fluid, which affects its elasticity, its active period is only 30 days, and its force tends to decrease over time.[1-5]

Every canine is pulled during fixed orthodontic treatment, whether using an elastomeric chain short, elastomeric chain long, closed coil spring, open coil spring, tends to cause pain for the patient. Which of the four components of the active device is the best in terms of the pain effect felt by the patient. Pain is a symptom that underlies most patients' rejection of proposed treatment plans. The success of treatment cannot be separated from factors of relief of pain in general, and failure to address these factors may leave patients fearful of returning.[6-10] This study aimed to compare pain intensity during canine extraction using closed coil spring niTi, open coil spring niTi, elastomeric chain short, and elastomeric chain long in fixed orthodontic treatment standard edgewise.

2. Methods

This study is a longitudinal experimental research. This research was conducted at the PPDGS (Specialist Dentist Education Program) Orthodontic FKG (Faculty of Dentistry) Clinic, Universitas Padjadjaran. The study subjects were patients who were still being treated orthodontically with a standard fixed edgewise appliance at the canine retraction stage using elastomeric chain short, elastomeric chain long, closed coil spring, open coil spring who were selected using a purposive sampling method according to the inclusion criteria. The inclusion criteria in this study were patients with all types of malocclusion who had the upper and lower first premolars removed. The canine tooth retraction stage was carried out after the alignment and leveling stage was completed. 4 anterior teeth were ligated, and posterior teeth were ligated using 0.018 stainless steel wire. steel, stop medial tube, tie back, female and male patients, permanent dental period, patient does not suffer from chronic systemic disease, aged 12-35 years, can read and understand Indonesian well, undergo standard edgewise fixed orthodontic treatment, willing were included as samples in the research and agreed to informed consent. A total of 16 research subjects participated in this study. This study has received approval from the medical and health research ethics committee of Universitas Padjadjaran.

After the orthodontic tools, brackets, and molar bands are installed, the patient, with the extraction of the 4 first premolars of the upper and lower jaw, has gone through the stage of alignment and leveling by using a wire bow-type stainless steel size 0.018 inches, tie back, ligation of 4 anterior teeth and posterior teeth, canine retraction stage, each appliance is installed in quadrants I, II, III, IV on the same patient, by means of the right side of the upper jaw closed coil spring hooked between the first molar and canine teeth, then attached to the left side open coil spring installed between the lateral incisor and canine, stop distal to the lateral incisor. Meanwhile, the elastomeric chain short, elastomeric chain long, and connected between the first premolar and canine teeth. The data analysis technique for this research is pain intensity analysis based on the time when the canine tooth is retracted using a tool elastomeric chain short, elastomeric chain long, closed coil spring, open coil spring, using the VAS questionnaire on the 1st, 3rd, and 7th days using non-parametric Kruskal Wallis statistical tests to find out whether there are significant differences between 3 different times on 4 different types of equipment.

3. Results

Table 1 shows that on the first day, there was no difference in the level of pain in the four groups (p = 0.973 > 0.05), whereas in the four groups, most patients were found to have moderate levels of pain. On the third day, there were no differences in pain levels in the four groups (p = 0.755 > 0.05). In the four groups, most patients were found to have moderate levels of pain (Table 2). On the seventh day, there were no differences in pain levels in the four groups (p = 0.079 > 0.05), whereas in the four groups, most patients were found without pain (Table 3).

Table 1. Comparison of closed coil spring, open coil spring, elastomeric chain short and elastomeric chain long first day.

Day	Treatment	Average (SD)	Median (min-max)	Pain category (f, %)				p-value
				No pain	Mild pain	Moderate pain	Severe pain	
Day 1	CC	32,38 (23,24)	35 (0 – 80)	1 (6,3%)	11 (68,8%)	3 (18,8%)	1 (6,3%)	0,973
	OP	33,63 (20,52)	35 (0 – 80)	1 (6,3%)	12 (75%)	2 (12,5%)	1 (6,3%)	
	CS	32,06 (23,04)	30 (0 – 90)	1 (6,3%)	11 (68,8%)	3 (18,8%)	1 (6,3%)	
	CL	30,09 (24,34)	25 (0 – 100)	1 (6,3%)	12 (75%)	2 (12,5%)	1 (6,3%)	

Description: CC: Close coil spring
OP: Open coil spring
CS: Elastomeric chain short
CL: Elastomeric chain long

Table 2. Comparison of closed coil spring, open coil spring, elastomeric chain short, and elastomeric chain long on the third day.

Day	Treatment	Average (SD)	Median (min-max)	Pain category (f, %)				p-value
				No pain	Mild pain	Moderate pain	Severe pain	
Day 3	CC	24,38 (17,4)	30 (0 – 50)	4 (25%)	10 (62,5%)	2 (12,5%)	0 (0%)	0,755
	OP	28,31 (17,89)	26,5 (0 – 60)	2 (12,5%)	12 (75%)	2 (12,5%)	0 (0%)	
	CS	20 (18,62)	20 (0 – 70)	4 (25%)	11 (68,8%)	1 (6,3%)	0 (0%)	
	CL	16,19 (20,03)	10 (0 – 80)	4 (25%)	11 (68,8%	0 (0%)	1 (6,3%)	

Description: CC: Close coil spring
OP: Open coil spring
CS: Elastomeric chain short
CL: Elastomeric chain long

Table 3. Comparison of closed coil spring, open coil spring, elastomeric chain short, and elastomeric chain long on the seventh day.

Day	Treatment	Average (SD)	Median (min-max)	Pain category (f, %)				p-value
				No pain	Mild pain	Moderate pain	Severe pain	
Day 7	CC	15,94 (21,23)	10 (0 – 70)	7 (43,8%)	7 (43,8%)	2 (12,5%)	0 (0%)	0,079
	OP	8,94 (15,29)	3 (0 – 60)	8 (50%)	7 (43,8%)	1 (6,3%)	0 (0%)	
	CS	4,38 (12,63)	0 (0 – 50)	13 (81,3%)	2 (12,5%)	1 (6,3%)	0 (0%)	
	CL	4,38 (10,78)	0 (0 – 40)	12 (75%)	4 (25%	0 (0%)	0 (0%)	

Description: CC: Close coil spring
OP: Open coil spring
CS: Elastomeric chain short
CL: Elastomeric chain long

Table 4. Comparison of pain levels in the CC group on the first, third, and seventh days.

Treatment	Day	Average (SD)	Median (min-max)	Pain category (f, %)				p-value
				No pain	Mild pain	Moderate pain	Severe pain	
CC	Day 1	32,38 (23,24)	35 (0 - 80)	1 (6,3%)	11 (68,8%)	3 (18,8%)	1 (6,3%)	0,141
	Day 3	30,63 (19,05)	30 (10 - 80)	0 (0%)	13 (81,3%)	2 (12,5%)	1 (6,3%)	
	Day 7	32,19 (21,98)	30 (10 - 80)	0 (0%)	12 (75%)	3 (18,8%)	1 (6,3%)	

Description: CC: Closed coil spring.

Table 4 shows no significant decrease in pain levels in the CC group from the first day to the seventh day, with a p-value = 0.141 > 0.05. There was a significant decrease in pain levels in the OP group from the first day to the seventh day, with a p-value = 0.001 < 0.05. Based on comparisons over time, from the first day to the third day, the decrease in pain levels was not significant (p = 0.137 > 0.05). A significant decrease in pain levels occurred from the third day to the seventh day (p < 0.05), Table 5.

Table 5. Comparison of open coil springs on the first, third, and seventh days.

Treatment	Day	Average (SD)	Median (min-max)	Pain category (f, %)				p-value
				No pain	Mild pain	Moderate pain	Severe pain	
OP	Day 1	33,63 (20,52)	35 (0 – 80)	1 (6,3%)	12 (75%)	2 (12,5%)	1 (6,3%)	0,001
	Day 3	28,31 (17,89)	26,5 (0 – 60)	2 (12,5%)	12 (75%)	2 (12,5%)	0 (0%)	
	Day 7	8,94 (15,29)	3 (0 – 60)	8 (50%)	7 (43,8%)	1 (6,3%)	0 (0%)	

Description: OP: Open coil spring.

There was a significant decrease in pain levels in the CS group from the first day to the seventh day, with a p-value = 0.000 < 0.05. Based on the comparison at each time, from the first day to the third day, there was a significant decrease in pain levels (p = 0.009 < 0.05). Likewise, there was a significant (significant) decrease in pain levels from the third day to the seventh day (p = 0.003 < 0.05), Table 6.

Table 6. Comparison of elastomeric chain short first, third, and seventh days.

Treatment	Day	Average (SD)	Median (min-max)	Pain category (f, %)				p-value
				No pain	Mild pain	Moderate pain	Severe pain	
CS	Day 1	32,06 (23,04)	30 (0 – 90)	1 (6,3%)	11 (68,8%)	3 (18,8%)	1 (6,3%)	0,000
	Day 3	20 (18,62)	20 (0 – 70)	4 (25%)	11 (68,8%)	1 (6,3%)	0 (0%)	
	Day 7	4,38 (12,63)	0 (0 – 50)	13 (81,3%)	2 (12,5%)	1 (6,3%)	0 (0%)	

Description: CS: Elastomeric chain short.

There was a significant decrease in pain levels in the CL group from the first day to the seventh day, with a p-value = 0.000 < 0.05. Based on the comparison at each time, from the first day to the third day, there was a significant decrease in pain levels (p = 0.009 < 0.05). Likewise, there was a significant decrease in pain levels from the third day to the seventh day (p = 0.011 < 0.05), Table 7.

Table 7. Comparison of elastomeric chain long first, third, and seventh days.

Treatment	Day	Average (SD)	Median (min-max)	Pain category (f, %)				p-value
				No pain	Mild pain	Moderate pain	Severe pain	
CL	Day 1	30,69 (24,34)	25 (0 – 100)	1 (6,3%)	12 (75%)	2 (12,5%)	1 (6,3%)	0,000
	Day 3	16,19 (20,03)	10 (0 – 80)	4 (25%)	11 (68,8%)	0 (0%)	1 (6,3%)	
	Day 7	4,38 (10,78)	0 (0 – 40)	12 (75%)	4 (25%)	0 (0%)	0 (0%)	

Description: CL: Elastomeric chain long.

4. Discussion

Results of research on pain intensity during canine tooth retraction using tools closed coil spring, open coil spring, elastomeric chain short, elastomeric chain long standard fixed appliance care edgewise Based on VAS on the 1st, 3rd, and 7th days it has a p-value> 0.05 indicating there is no difference in pain intensity. Based on other research, it was concluded that there was no difference in pain intensity if the same force was applied until the 7th day and if light and continuous pressure was applied that did not damage the PDL tissue. The intensity of pain increases from the first day reaches a peak after 24 hours, and there is a decrease in the degree of pain over time.[11-15]

In this study, there was no significant difference between tool use of closed coil springs 1st, 3rd, and 7th days due to the decreased force of closed coil springs after the first 24 hours, it is only 3%, and after 28 days, it is 8%-20%, due to the force produced closed coil spring more consistent in comparison elastomeric chain, there is a significant difference in the use of tools elastomeric chain short, elastomeric chain long, due to a decrease in force elastomeric chain after 24 hours installation is 50% -70%. Other research proves that the peak intensity of pain occurs in the first twenty-four hours and even tends to persist for the first two days. Other research also suggests that the pain begins to feel worse in the first four hours and reaches its peak within 24 hours after initial canine retraction, after which the pain gradually decreases or decreases.[16-20]

5. Conclusion

There was no difference in the intensity of pain after canine retraction using closed coil spring, open coil spring, elastomeric chain short, and elastomeric chain long devices in standard edgewise fixed treatment based on VAS on the 1st, 3rd, and 7th days. There was no difference in intensity. pain after canine retraction using a closed coil spring appliance in standard edgewise fixed treatment based on VAS on the 1st, 3rd, and 7th days. There is a difference in pain intensity after canine retraction using a short elastomeric chain and a long elastomeric chain appliance. standard edgewise fixed treatment based on VAS on the 1st and 3rd days.

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