

Perception of pain during initial fixed orthodontic treatment

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Abstract

Aim: The present study aims to evaluate the pain experienced by individuals during the first days of fixed orthodontic treatment.

Methodology: One hundred and twenty patients (65 female; mean age: 18 ± 21 years) were given fixed orthodontic treatment, including the placement of a 0.014 Ni-Ti conventional arch wire (American Orthodontics, Sheboygan, Wisconsin, USA) after the bonding procedure with maxillary and mandibular rear 0.022" slot Roth brackets (Mini Master Series, American Orthodontics, Sheboygan, Wisconsin, USA). A visual analog scale (VAS) was used to assess the level of pain the patients experienced on the first, second, and seventh days of the treatment. The mean VAS scores of the male and female patients were compared using the student's t-test, ANOVA, and the chi-square test.

Results: Males were found to have higher mean VAS scores on the first and second days of the treatment compared to the females ($p = 0.001$ and $p = 0.038$, respectively). A greater proportion of the patients (33.33%) experienced pain on the first day of the treatment compared to the second and seventh days ($p < 0.05$).

Conclusion: It was determined that the patients experienced the highest level of pain on the first day of fixed orthodontic treatment. The male patients experienced a higher level of pain than the females on the first and second days of the treatment.

Keywords: pain perception, orthodontic treatment, visual analog scale (VAS)

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Introduction

Pain and discomfort are common complications in fixed orthodontic treatment. Although the pain differs among individuals, it generally starts within 4 hours after the beginning of the fixed orthodontic treatment, increases within the first 24 hours, and decreases in seven days (1). The reason for the pain and discomfort

in orthodontic treatment is related to factors such as edema, inflammation, ischemia, and pressure occurring due to tooth movement.

One of the most widely used methods to measure the perceived severity of pain is the visual analog scale (VAS). VAS is used to measure the pain perceived by individuals during fixed orthodontic treatment (2, 3) and is reported to be the most reliable method for measuring pain perception (4, 5). It is preferred for its

ease of implementation, practicability, and pellucidity (1, 4, 5).

The two most important reasons for pain and discomfort during orthodontic treatment are the intensity and duration of orthodontic treatment (6). Understanding the level of pain perceived by individuals would have positive effects on increasing patient satisfaction and oral health quality (7, 8).

The reasons for discomfort during orthodontic treatment can be attributed to the force transmitted by the arch wire, ligation method, soft tissue ulceration, and chewing difficulties (9). Lew stated that 30% of patients have quit orthodontic treatment in the beginning because of the pain (10). Adult individuals were reported to feel a higher level of pain in comparison to children (11). Compared to the pain arising from tooth extraction, the placement of the arch wire in fixed orthodontic treatment was specified as causing a longer and more intense pain (12).

In fixed orthodontic treatment, physiological tooth movement occurs because of the transmission of force to the teeth through the arch wires. Thus, to produce the minimum pathological effect on adjacent tissues, mild and continuous forces are desired (13).

At the beginning of orthodontic treatment, variability in pain perception is observed depending on the age and social status of the patient, force transferred by the arch wire after placement, relationship between dental arches, and crowding of teeth (2). Pain during fixed orthodontic treatment occurs owing to heavy force on the teeth either while normal chewing or spontaneously. Psychology, sociocultural status, and environmental factors cause difficulties in objectively assessing pain perception (5).

The present study aimed to evaluate the pain among individuals at the beginning of fixed orthodontic treatment. Moreover, it aimed to determine on which day the highest level of pain is experienced.

The null hypotheses of this study are as follows:

- A higher level of pain will be experienced on the first and second days of fixed orthodontic treatment than on the seventh day.
- There is no difference between female and male individuals in terms of the level of pain perceived at the beginning of treatment.

Materials and Methods

The present study, which has cross-sectional descriptive study design, was carried out by conducting a survey on 120 (65 female and 55 male) individuals who had no systemic disease or mental problem, were between 13 and 42 years (18 ± 21), have good oral hygiene, needed fixed orthodontic treatment, and would undergo fixed orthodontic treatment in the Department of Orthodontics of Sakarya University. Those with previous orthodontic treatment history, functional apparatus, having planned maxillary expansion protocols, or needing daily use of analgesic medications for migraine, neuralgia, and so forth were

not included in the study. The rate of participation was 100%, and written consent was obtained from the participants to verify their voluntariness. The study was carried out upon the approval of Sakarya University's Medical Faculties of Ethics Committee (71522473/050.01.04/409). The principles of the Helsinki Convention were followed.

In planning the treatment, tooth extractions were performed three weeks before the bonding procedure for the patients requiring tooth extraction. After both maxillary and mandibular rear 0.022" slot Roth (Mini Master Series, American Orthodontics, Sheboygan, Wisconsin, USA) brackets were placed, the fixed orthodontic treatments of all the patients were started by placing a 0.014 Ni-Ti (American Orthodontics, Sheboygan, Wisconsin, USA) conventional arch wire. For all the participants, the VAS was used to assess the level of pain they felt on the first, second, and seventh days of fixed orthodontic treatment. An additional item was added to the scale to determine which of the participants experienced the highest level of pain. VAS was previously used to assess the pain experienced during fixed orthodontic treatment (3, 14, 15). It is considered an affordable and simple method that can be adapted to individuals from any age group or sociocultural plan to obtain data about the individuals' self-perceptions (16). VAS is a 100 mm horizontal line containing definitive words on both ends. The "no pain" statement is fixed at the 0 mm end and "maximum pain" at the 100 mm end (17). The individuals are asked to draw a vertical line at the point referring to the level of pain they are experiencing.

Statistical analysis

The statistical analyses of data were performed in SPSS Statistics Version 23 (IBM SPSS Inc., Armonk, NY, USA) using one-way ANOVA, independent samples Student's t-test, and chi-square test. The level of significance was set at $p < 0.05$.

Results

In this study, 120 patients, 65 female (54.1%) and 55 male (45.8%), with the mean age of 21.2 ± 2.4 years were examined.

Table 1 presents the comparison between VAS values of men and women on the first, second, and seventh days of fixed orthodontic treatment by using Student's t-test. Given the mean VAS values on the first day of fixed orthodontic treatment, it can be stated that male patients felt a statistically significant higher level of pain compared to female patients ($p = 0.001$). On the second day of treatment, the male patients also felt a higher level of pain, and the difference was statistically significant ($p = 0.038$). For the seventh day of treatment, a comparison of the VAS values of male and female participants showed no statistically significant difference ($p > 0.05$).

Table 2 illustrates the comparison between mean VAS scores of all the individuals for the first, second, and seventh days of fixed orthodontic treatment, and statistically significant differences were found in terms of the level of pain felt ($p=0.029$).

According to the answers given to the question asked for determining on which day the highest level of pain was felt, Table 3 reveals that 75 out of 120 patients felt the highest level of pain within the first

two days of fixed orthodontic treatment. With the use of the chi-square test, it was determined that 40 (33.33%) individuals felt the highest level of pain on the first day of fixed orthodontic treatment and 35 (29.16%) on the second day of fixed orthodontic treatment ($p=0.034$). Comparing the mean VAS scores for the level of pain felt on the seventh day revealed a statistically significant difference ($p=0.023$).

Table 1. Comparison between mean scores regarding the level of pain perceived on by the gender

	1 st day VAS			2 nd day VAS			7 th day VAS		
	Min	Mean±SD	Max	Min	Mean±SD	Max	Min	Mean±SD	Min
Female (n=65)	60,3	61,2±1,1	62,2	60,9	61,3±1,5	62,8	17,2	18,3±1,9	20,1
Male (n=55)	64,5	65,9±1,5	67,9	63,9	64,6±1,4	65,2	18,3	19,7±0,9	20,9
Student's t-test	$p= 0.001$			$p= 0.038$			$p>0,05$		

Student's t-test $p<0.05$, n= number of patients, VAS: Visual Analog Scale

Table 2. Comparison between the individuals' levels of pain perceived on different days of treatment

	1 st day			2 nd day			7 th day		
	Min	Mean±SD	Max	Min	Mean±SD	Max	Min	Mean±SD	Min
VAS	60,3	64,6±2,7	67,8	60,9	63,2±2,4	66,3	17,1	18,6±1,5	21,8
ANOVA	$p= 0.029$								

ANOVA $p<0.05$, n= number of patients, VAS: Visual Analog Scale

Table 3. The day of the highest level of pain and mean VAS scores

	1st day	2nd day	3rd day	4th day	5th day	6th day	7th day
n	40	35	26	11	2	6	-
(%)	(%33,33)	(%29,16)	(%21,66)	(%0,09)	(%0,01)	(%0,05)	-
Chi- Square Test				0,034			
VAS	64,6±2,7	63,2±2,4	64,2±2,5	56±1,6	54±2,7	46±1,4	18,6±1,5
ANOVA				0,023			
Chi- Square Testi and ANOVA p<0.05, n= number of patients							

Discussion

While aiming to have treatment for malocclusions in order to correct crowding and esthetic problems, individuals also worry about the pain that will occur because of the treatment procedure. This study aims to assess the level of pain felt by individuals during the first days of fixed orthodontic treatment. It was reported in previous studies that patients felt pain in fixed orthodontic treatment (1, 14, 18).

The first null hypothesis that patients will feel a higher level of pain on the first and second days of fixed orthodontic treatment than on the seventh day was supported. The second hypothesis that there is no difference between female and male patients in terms of the level of pain was rejected.

VAS scale was used to determine the level of pain felt by the individuals. VAS is a method widely used to assess the pain and discomfort felt during orthodontic treatment (2, 14, 20). It is an easy-to-apply, reliable, reproducible, and easy-to-understand method for patients (1, 4, 5).

The present study found that, compared to women, men felt a higher level of pain on the first and second days of treatment. In previous studies, it was reported that there was no significant difference between men and women in terms of the level of pain felt during fixed orthodontic treatment (2, 14, 18-20). Scheurer et al. reported that, compared to men, women felt a higher level of pain during fixed orthodontic treatment (21). The difference between our findings and the finding that men felt a higher level of pain than women did might be because the assessment of pain level is a subjective process. Differences in terms of patient age, crowding, and psychological factors might cause differences in the level of pain perception.

It was observed that the highest level of pain was felt on the first day of fixed orthodontic treatment. Many researchers reported that the highest level of

pain was felt within the first 24 hours of fixed orthodontic treatment (1, 2, 20, 21).

Similar to previous studies, in this research, the highest level of pain was felt within the first two days of fixed orthodontic treatment, decreased in the following days, and then reached minimum level on the seventh day (2, 19, 20).

All the patients felt the highest level of pain on the first day of fixed orthodontic treatment. The pain they felt decreased during the following days, and the minimum level was reached on the seventh day. Scott et al. reported that the individuals felt the highest level of pain within the first 4 or 24 hours of orthodontic treatment, but there were statistically significant differences between individuals. Statistically significant decreases in the level of pain were observed on the third and seventh days of treatment (1).

Seroglou et al. reported that the patients who were aware of the severity of orthodontic irregularities and capable of controlling their feelings perceived a lower level of discomfort (22). Since psychological factors affect patients' sense of discomfort and adaptation to the pain during orthodontic treatment, the patients should be motivated before the treatment by informing them about the severity and scope of malocclusion (2, 14).

In the present study, 33.33% of all the patients reported feeling the highest level of pain on the first day of orthodontic treatment while 29.26% felt the highest level of pain on the second day. A total 91% of patients stated that they felt pain at certain steps of the orthodontic treatment. Approximately 95% of patients stated that they felt pain in the first 24 hours of the fixed orthodontic treatment. There were also patients who reported feeling no pain (11, 21, 23). Among the adolescent patients, 87%-95% of them reported pain during the first 24 hours of fixed orthodontic treatment. It was emphasized that 39%-49% of patients felt pain in every step of the treatment (14, 15, 24).

Individuals' level of perceiving pain during the first days of fixed orthodontic treatment was examined in this work. Future studies examining the level of pain by using as well as the effect of pain on individuals' quality of life would be useful in terms of increasing the motivation of patients for orthodontic treatment and informing them.

Conclusions

After the patients started the fixed orthodontic treatment, they felt the highest level of pain on the first day. Compared to women, men felt a higher level of pain on the first and second days of treatment.

Ethical Approval: Ethics committee approval was received for this study from Sakarya University, Faculty of Medicine Ethics Committee in accordance the World Medical Association Declaration of Helsinki, with the approval number: 71522473/050.01.04/409.

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