

PAIN AND CHEWING SENSITIVITY DURING FIXED ORTHODONTIC TREATMENT IN EXTRACTION AND NON-EXTRACTION PATIENTS

Sabit Ortodontik Tedavi Sırasında Çekimli ve Çekimsiz Hastalarda Ağrı ve Çiğneme Hassasiyetinin Değerlendirilmesi

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Received: 29/06/2016

Accepted: 29/08/2016

ABSTRACT

Purpose: The aim of this study was to evaluate the differences in pain perception and chewing sensitivity between extraction and non-extraction patients. **Subjects and Methods:** Thirty orthodontic patients (11 males, 19 females) were included in this study who were classified as extraction (n=15; 6 males, 9 females) and non-extraction patients (n=15; 7 males, 8 females). The mean age of patients were 15.10±1.83 years in non-extraction group and 15.44±0.75 years in extraction group. The patients were asked to complete the Visual Analogue Scale (VAS) questionnaire and they were asked to mark the presence or absence of sensitivity during 7 days after the first arch wire placement. Pain intensity comparison between groups was performed using the Mann-Whitney U test. The Friedman test was used to analyze within-group differences over time. **Results:** There were no significant differences in pain scores between the groups. Pain levels significantly decreased between day 1 and day 3 in both the groups. No differences were found in the chewing sensitivity between the non-extraction and extraction groups. **Conclusion:** No difference in the pain perception was observed between the extraction and non-extraction patients during the 7 days after arch wire placement.

Keywords: Orthodontic treatment; brackets; pain; mastication; tooth extraction

ÖZ

Amaç: Bu çalışmanın amacı çekimli ve çekimsiz ortodontik tedavi hastalarında ağrı ve çiğneme hassasiyetindeki farklılığın değerlendirilmesidir.

Bireyler ve Yöntem: Çalışmaya çekimli (n=15; 6 erkek, 9 kadın) ve çekimsiz (n=15; 7 erkek, 8 kadın) olarak sınıflanan 30 ortodonti hastası (11 erkek, 19 kadın) dahil edilmiştir. Hastaların yaş ortalamaları çekimsiz hasta grubunda 15,10±1,83 yıl, çekimli hasta grubunda ise 15,44±0,75 yıldır. Hastalar ilk ark telinin takılmasını takip eden 7 gün boyunca bir Görsel Analog Skala anketi üzerinde ağrı ve çiğneme hassasiyetinin var olup olmadığını işaretlemişlerdir. Gruplar arası ağrı şiddetinin karşılaştırılmasında Mann-Whitney U test kullanılmıştır. Grup içi farklılıkların karşılaştırılmasında Friedman testi kullanılmıştır.

Bulgular: Ağrı skorlarında gruplar arasında farklılık bulunmamıştır. Her iki grupta da ağrı seviyeleri 1. ile 3. gün arasında anlamlı oranda düşmüştür. Çekimli ve çekimsiz gruplar arasında çiğneme hassasiyetinde farklılık bulunmamıştır.

Sonuç: Ark teli yerleştirilmesini takiben 7 gün boyunca ağrı algısında çekimli ve çekimsiz hastalarda bir farklılık bulunmamıştır.

Anahtar kelimeler: Ortodontik tedavi; braket; ağrı; çiğneme; diş çekimi



Introduction

Prolonged pressure produced by an orthodontic force applied to a tooth results in an acute inflammatory response with periodontal vasodilatation and subsequent osteoblastic and osteoclastic activity. Pressure in the periodontium is followed by ischemia, inflammation, and edema, which cause pain and discomfort (1-4). Thus, pain is usually experienced in response to an orthodontic force. Previous studies reported that 90%–95% of patients suffered from pain after orthodontic procedures (5, 6). Fear of pain may avoid a person from undergoing orthodontic treatment and can be a reason for discontinuing the treatment. About 10% of patients quit the orthodontic treatment because of pain (7). Pain perception is related to age, individual pain threshold, motivation, psychological condition, and previous negative dental experience of the patient and the magnitude of the orthodontic force (8). Previous reports have shown that older patients experienced more pain than younger patients (7, 9-11). Some previous reports showed that women complained more about pain than men (12, 13). However, other reports showed that gender differences were not related to pain perception (9, 14, 15). After placement of an arch wire, pain begins in 4 hours and reaches the maximum level at 24 hours (5-7). The pain is at its highest level for 1–3 days and subsequently decreases in 7 days due to the beginning of orthodontic tooth movement (6, 7, 16, 17). Bergius *et al.* (5) reported that 25–42% of patients experienced pain even after 7 days of wearing elastic separators. Previous studies reported that pain after arch wire placement could be as worse as that experienced after tooth extraction (7, 14, 15). An orthodontist must keep in mind that pain is subjective and pain perception can vary from person to person. The relationship between the magnitude of orthodontic force and pain perception was studied by many researchers (9, 10, 18). Some researchers stated that large forces causes greater pain (4, 19). However, Jones (10) observed that there was no correlation between the initial crowding, applied forces, and the severity of pain. Pain perception can be evaluated using the Visual Analog Scale (VAS). The VAS enables the patients to indicate the precise intensity of their pain. To indicate the pain intensity, patients mark a point on a 100 mm horizontal line, corresponding to their pain intensity. It provides the maximum opportunity to each patient to express a personal response. VAS data are usually recorded as the number of millimeters on a line ranging from 0 to 100 (20). In most studies, VAS was used to evaluate pain perception because it is a rating scale with minimum constraints (21). Although many studies regarding orthodontic pain have been conducted, no study

has compared the pain perception in orthodontic extraction patients with that in non-extraction patients. More tooth movement was expected in extraction group and as a result, the author of this study expected a difference in the pain and chewing sensitivity between extraction and non-extraction groups. The previous reports stated that maximum pain occurred especially in the first 24 hours and therefore the duration of this study was limited by 7 days (5-7). The aim of this study was therefore to test the null hypotheses that there is no difference in pain experience and there is no difference between chewing sensitivity in extraction and non-extraction patients during the first 7 days following initial arch wire placement.

Subjects and Methods

Sample characteristics

The Human Ethics Committee (Clinical Research Ethics Committee) at Istanbul Medipol University approved this study and approval number was 10840098-47. The informed consents were obtained from all patients and their parents. The study group consisted of 30 patients (N=30) (11 males, 19 females) who were chosen from the patients scheduled to undergo orthodontic treatment. 15 extraction (n=15) (6 males, 9 females) and 15 non extraction (n=15) (7 males, 8 females) treatment patients were selected. Inclusion criteria for this study were as follows: (1) patients between 11 and 18 years, 2) no systemic disease, 3) no previous medication, 4) presence of crowding and fixed orthodontic treatment need in both upper and lower jaw. The mean amount of crowding of the patients were -7.1 ± 3.4 mm in maxillary arch and -6.8 ± 2.9 mm in mandibular arch in non-extraction group and -4.6 ± 3.2 mm in maxillary arch and -3.2 ± 2.4 mm in mandibular arch in extraction group. The mean ages of the patients were 15.10 ± 1.83 years in non-extraction group and 15.44 ± 0.75 years in extraction group.

Orthodontic treatment protocol

All patients were treated by same author using 0.018 inch slot Gemini 3M Unitek metal brackets (Gemini, 3M Unitek, Monrovia, CA, USA). Extractions were made at least 2 weeks before bonding. Bonding of all brackets of upper and lower jaw was applied in the same visit. The initial (1st) arch wire was 0.012 inch nickel titanium (Nitinol classic, 3M Unitek, Monrovia, CA, USA) for all the patients and the arch wire was fully engaged in the bracket slots using elastomeric ligatures. No additional intra-oral or extra-oral appliances were placed. Similar oral hygiene instructions were given to all of the patients and

Table 2. Percentage of chewing sensitivity in extraction and non-extraction groups (a: The Fisher's Exact chi-squared test, b: Yates-corrected chi-squared test).

	Non extraction				Extraction				p	
	No		Yes		No		Yes			
	n	%	n	%	n	%	n	%		
Day 1	0	0.0%	15	100%	2	13.3%	13	86.7%	0.483	a
Day 2	1	6.7%	14	93.3%	1	6.7%	14	93.3%	1.000	a
Day 3	1	6.7%	14	93.3%	2	13.3%	13	86.7%	1.000	a
Day 4	2	13.3%	13	86.7%	2	13.3%	13	86.7%	1.000	a
Day 5	6	40.0%	9	60%	6	40.0%	9	60.0%	1.000	b
Day 6	9	60.0%	6	40.0%	8	53.3%	7	46.7%	1.000	b
Day 7	11	73.3%	4	26.7%	10	66.7%	5	33.3%	1.000	a

Table 3. Chewing sensitivity assessment of non-extraction-group in relation to Cochran's Q test ($p < 0.001$).

Non Extraction	No	Yes
Day 1	0	15
Day 2	1	14
Day 3	1	14
Day 4	2	13
Day 5	6	9
Day 6	9	6
Day 7	11	4

Table 4. Chewing sensitivity assessment of extraction-group in relation to Cochran's Q test ($p < 0.001$).

Extraction	No	Yes
Day 1	2	13
Day 2	1	14
Day 3	2	13
Day 4	2	13
Day 5	6	9
Day 6	8	7
Day 7	10	5

Table 5. Distribution of patients in the groups of taking and non-taking medication. Yates-corrected chi-squared test ($p < 0.001$).

Group	Non-medication		Medication		Total	
	n	%	n	%	n	%
Non-extraction	5	33.3%	10	66.7%	15	100%
Extraction	6	40.0%	9	60.0%	15	100%
Total	11	36.7%	19	63.3%	30	100%

Table 6. The frequency of medication days.

Medication Days	Frequency	%
None	11	36.7
Day 1	5	16.7
Day 1, Day 2	9	30.0
Day 1, 2, 3	4	13.3
Day 1,2,3,4 and 6	1	3.3
Total	30	100

Discussion

This study included 30 patients (11 males and 19 females) who were chosen among the patients scheduled to undergo orthodontic treatment. To eliminate the effect of age on pain perception, patients of similar age were selected. Discrimination of gender was not considered because previous reports stated that pain and gender of the patient had no correlation with each other (9, 14, 15). Patients with Angle class I malocclusions that required extraction and non-extraction treatments were included in this study. Jones and Richmond (22) reported that there were no correlations between initial tooth positions, applied force, and discomfort; therefore, in this study, the amount of crowding was not evaluated, and the patients were classified only as non-extraction and extraction patients (23). Patients with similar age and social class were included in this study. All the fixed appliances were bonded using the same type of orthodontic brackets and the same size of arch wires on both the upper and lower jaws. To evaluate pain perception, the patients were asked to complete the VAS questionnaire and to mark the presence or absence of sensitivity during the 7 days after the 1st arch wire placement. The patients were advised to complete the questionnaire early in the morning to avoid the possible effects of medication on pain perception. The VAS questionnaire was reported to be the most reliable scale for evaluating subjective experiences. Therefore, VAS questionnaire was used to evaluate pain perception in this study (5, 11).

The results showed that the pain levels indicated by VAS scores had no significant differences between the extraction and non-extraction groups. In both groups, pain levels were significantly different between day 1 and day 3. Pain levels were maximum in day 1 and this finding confirms previous reports

(5, 7, 24, 25). Similar to previous reports, pain levels were the highest on day 1. After arch wire placement, the pain levels decreased significantly from day 3–7, similar to previous reports (15, 23). In this study, on day 2, the decrease in pain in the non-extraction group was higher than that in the extraction group; however, it was not statistically significant. On day 1 after arch wire placement, 93% of the patients reported pain; the number decreased to 30% after 7 days. Tecco *et al.* (26) reported that 95% of the patients treated by conventional metal brackets reported pain on day 1 after arch wire placement and 30% of them reported pain on day 8.

No reports regarding chewing sensitivity in fixed orthodontic treatment were found in the literature. The author of this article believes that orthodontic pain should be evaluated separately from chewing sensitivity. In this study, evaluation of chewing sensitivity showed that there were no significant differences between the extraction and non-extraction groups; however, in the initial 4 days, the level of chewing sensitivity was higher than that in the last 3 days in both of the groups. The breakpoint of pain level occurred on day 3 and the breakpoint of chewing sensitivity level occurred on day 4. According to the statements of the patients, most analgesics were consumed during the initial 2 days after ligation of the 1st arch wire. For analgesia, acetaminophen was advised in order to prevent the side effects of non-steroidal anti-inflammatory drugs. On day 7, the pain levels were significantly lower than that on day 1; although 30% of the patients reported pain on day 7, none of them used analgesics.

The most important limitation of this study is the duration of the observation. Longer observation time is needed to detect the pain perception between the extraction and non-extraction patients more precisely.

Conclusion

No differences in pain perception and chewing sensitivity were observed between the extraction and non-extraction patients. Pain decreased significantly from day 1 to day 3 and continued to decrease until day 7 in both of the two groups. Chewing sensitivity was higher in the initial 4 days of the 7 days than that in the last 3 days, in both groups. Thus, it would be appropriate to recommend analgesics to extraction treatment patients as well as non-extraction treatment patients during the initial 3 days of orthodontic treatment.

Source of funding

None declared.

Conflict of interest

None declared.

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