

Intensity of pain due to separators in adolescent orthodontic patients

Abdullah M. Aldrees

ABSTRACT

Objective: To investigate the intensity of pain adolescent orthodontic patients experience following the insertion of separators.

Materials and Methods: Elastomeric separators were placed mesially and distally to the first molars in 62 adolescents (20 male, 42 female, age 12–15 years), and the participants were given self-administrated questionnaires to document perceived pain, pain upon chewing, and the severity of pain's affecting daily life, using a visual analog scale for seven days.

Results: The mean perceived pain scores out of 100 on the first 3 days were 54.6 ± 32.7 , 51.7 ± 29.9 , and 32.3 ± 28.4 , respectively; chewing pain scores were: 61.9 ± 35.3 , 52.6 ± 30.4 , and 39.5 ± 32.1 , respectively; the pain's affecting daily life scores were 24.9 ± 35.5 , 21.1 ± 30.9 , and 11.9 ± 23.7 , respectively. A Kruskal–Wallis test showed a statistically significant difference in the reported pain between the three studied parameters. A Mann–Whitney U-test showed an insignificant difference between male and female adolescents.

Conclusion: Pain perception varies among adolescent patients, but it decreases significantly after the first 2 days, with no gender differences.

Key words: Adolescents, orthodontic pain, separators

INTRODUCTION

Pain is a subjective response, has large individual variations, and depends on factors such as age, gender, individual pain threshold, present emotional state and stress, cultural differences, and previous pain experiences. In orthodontics, patients experience pain as a result of separator placement, insertion of aligning archwires, headgear wear, and rapid palatal expansion.^[1-3]

Patients who experience frequent headaches and those who anticipate a greater effect of pain on their activities reported

more pain within the first week after an archwire insertion.^[1] These results suggest that anxiety and a history of chronic pain lead to an exaggeration of the reported pain. The attitude toward orthodontic treatment has also been correlated with discomfort felt after appliance placement.^[4] Patients with previous knowledge of orthodontic treatment reported less pain, and those who experienced less pain had a more positive attitude toward treatment.^[5] Recently, psychological factors (dental anxiety, pain catastrophizing) have been shown to influence significantly the pain perceived following the insertion of orthodontic separators.^[6]

Several methods were proposed to address the pain associated with orthodontic treatment. Among them, the administration of nonsteroidal anti-inflammatory drugs (NSAIDs) has been proven to be the most effective pain-control technique. It has been shown that the use of NSAIDs in low doses for 1 or 2 days does not cause interference with the inflammation process associated with tooth movement.^[7] When different

Department of Pediatric Dentistry and Orthodontics, College of Dentistry, King Saud University, Riyadh, Saudi Arabia

Address for correspondence: Dr. Abdullah M Aldrees, Division of Orthodontics, Department of Pediatric Dentistry and Orthodontics, College of Dentistry, King Saud University, P.O. Box 60169-38, Riyadh 11545, Saudi Arabia.
E-mail: amaldrees@ksu.edu.sa

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types of analgesics taken before and after the placement of separators were tested, ibuprofen was shown to reduce the pain significantly more than the placebo in a sample of adult patients.^[8]

Clinical trials by Ngan *et al.* concluded that discomfort is associated with separator placement, starting within 4 h of insertion and increasing over the next 24 h, then decreasing to a preplacement level within 7 days.^[9-11] In a sample of 12–18-year-old patients, pain felt after separator placement declined after 2 days for most of the studied individuals, but a number of patients, mainly female, experienced pain for a longer period.^[12] Bondemark *et al.* evaluated the patient perception of pain and discomfort with orthodontic separators and reported that patients experienced the worst pain on day 2, and the pain subsided almost completely by day 5.^[13] In a sample of children, the perception of pain peaked 1-day after separator placement and reduced to pretreatment level after 1-week. Interleukin-1 β , substance P, and PGE2 have been detected in the gingival crevicular fluid and are associated with the pain intensity.^[14] In adults, pain continues to increase after the 1st day and peaks on the 3rd day before decreasing. Elastomeric separators are more painful compared to springs from day 2 to day 4, after which all types of separators produce similar discomfort levels.^[15]

Few reports have documented adolescents' pain perception in relation to orthodontic treatment; therefore, the aim of this study was to investigate the intensity of pain adolescent orthodontic patients experience following the insertion of separators.

MATERIALS AND METHODS

Ethical approval to conduct the study was obtained from the College of Dentistry Research Center at King Saud University. Adolescents scheduled to have comprehensive fixed appliance orthodontic treatment at different governmental and private orthodontic clinics in Riyadh, Saudi Arabia, were asked to participate in this study. All patients were informed that their participation in the study was confidential and on a voluntary basis, and a signed consent form was obtained from their guardians.

Elastomeric separators were placed mesially and distally to the upper and lower first permanent molars in 62 adolescents (age range 12–15 years; 20 males and 42 females). Following separator placement, the patients were given self-administrated questionnaires in the form of logbooks to take home, and they were instructed on how to answer the questions. The questionnaire consisted of three questions that documented the perceived "pain," "pain upon chewing," and "severity of pain's affecting daily life activities," using a visual analog scale (VAS) along a 100 mm line. The participants were asked to mark spots on the line that they believed best represented the pain they perceived at that time. On the right end of the line, the phrase "no pain at all" was written, while on the left end, the phrase "very severe pain" was written. The VAS score was measured

to the nearest mm from the right end of the line to the patient's mark. The evaluation of pain started on the 1st day, 4 h after the placement of the elastomeric separators, and continued daily for seven days.

The data were analyzed using IBM® SPSS® Statistics, version 20 (International Business Machines Corporation, Armonk, New York, USA), and the level of significance was set at $P < 0.05$. Descriptive statistics and comparisons between male and female perceptions of pain and pain scores of the parameters were calculated.

RESULTS

The mean age of the participants was 13.82 years \pm 1.17. The average scores of the three parameters during the study period (7 days) are illustrated in Figure 1. The mean perceived pain scores out of 100 on the first 3 days were 54.6 \pm 32.7, 51.7 \pm 29.9, and 32.3 \pm 28.4, respectively, while chewing pain scores were 61.9 \pm 35.3, 52.6 \pm 30.4, and 39.5 \pm 32.1, respectively, and the pain's affecting daily life scores were 24.9 \pm 35.5, 21.1 \pm 30.9, and 11.9 \pm 23.7, respectively. A Kruskal–Wallis test showed a statistically significant difference between the three studied parameters ($P < 0.01$). "Pain" and "pain upon chewing" scores were significantly higher than the "pain's affecting daily life" scores. Pain scores started to decrease significantly after the 2nd day when each of the three parameters was studied over the study period.

The mean perceived pain scores of the three parameters reported by the male and female adolescents are shown in Table 1. A Mann–Whitney U-test shows insignificant differences between male and female adolescents. Figure 2 shows the percentage of male and female patients who reported feeling any pain over the study period. More female patients reported feeling pain on the 3rd day until the 7th day than the male patients.

The variations in the perceived pain scores are illustrated in Figure 3. The median perceived pain scores in the first 3 days

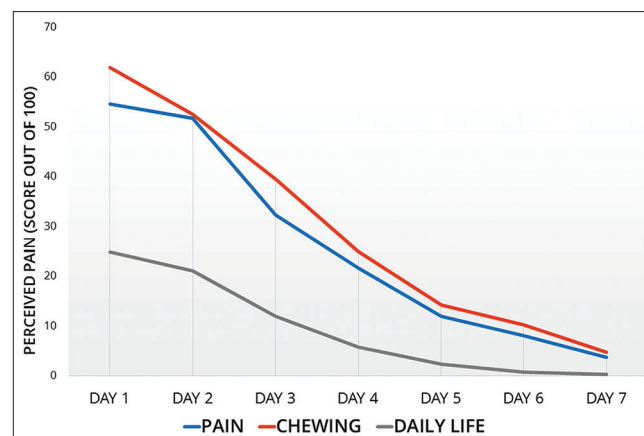
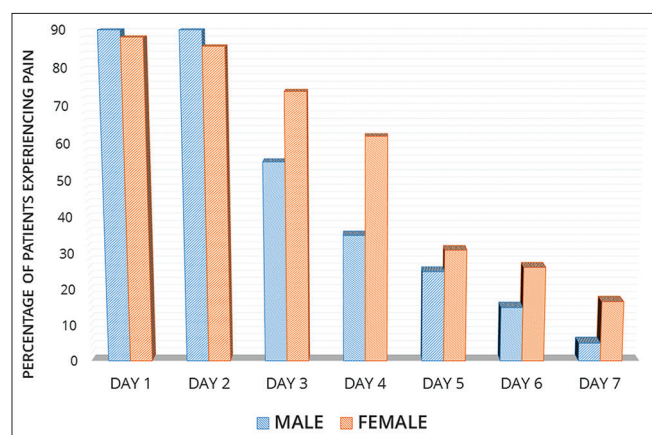
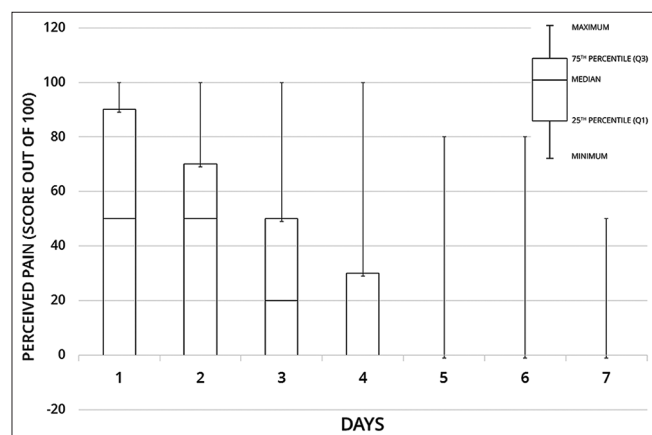


Figure 1: Graph showing the mean scores of the three pain parameters reported by the entire sample during the seven-day period

Table 1: Mean and SD of the pain scores of the three parameters reported by the male and female adolescents during the study seven-day period

Time	Male patients (n=20)						Female patients (n=42)					
	Pain		Chewing		Daily life		Pain		Chewing		Daily life	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1 st day	58.00	30.711	66.25	32.561	26.50	34.683	52.98	33.823	59.81	36.663	24.17	36.256
2 nd day	49.00	27.701	49.25	33.493	16.75	26.768	52.98	31.079	54.17	29.090	23.21	32.793
3 rd day	23.75	24.861	28.00	31.514	7.50	16.182	36.43	29.265	45.00	31.235	14.05	26.509
4 th day	14.00	21.374	15.75	27.012	0.00	0.000	25.36	27.528	29.40	29.574	8.57	22.149
5 th day	9.25	18.373	8.50	17.852	0.00	0.000	13.33	22.077	17.02	24.322	3.45	13.089
6 th day	6.50	15.985	8.00	18.525	0.00	0.000	8.81	17.137	11.31	20.154	1.19	7.715
7 th day	1.50	6.708	2.50	7.864	0.00	0.000	4.76	12.344	5.83	12.779	0.48	3.086

SD – Standard deviation

**Figure 2:** Bar graph illustrating the percentage of male and female patients reporting feeling any pain over the study period**Figure 3:** Box plot showing the perceived pain scores reported by the entire sample

were 50, 50, and 20, respectively; however, the ranges of pain scores are wide, as can be seen on each day.

DISCUSSION

Pain resulting from orthodontic procedures has been previously documented, and methods to manage it were suggested. In addition to the use of NSAIDs, other methods were reported, including the application of anesthetic gel,^[16] the use of vibratory

stimulation,^[17] and the application of continuous wave low-level laser therapy.^[18]

The current study utilizes the VAS for documentation of pain perception. As a subjective method of measuring pain, the VAS has been used extensively in many studies and has been described as an easy and reliable way to demonstrate small variations in pain intensity.^[9,19-22] The validity of the VAS for reporting pain has been demonstrated in young children,^[23] and it was previously utilized to record pain intensity induced by orthodontic separators in child and adolescent samples.^[13,14]

The adolescents studied perceived the most severe pain within the 1st day of separators placement. Ngan *et al.*,^[9,10] Wilson *et al.*,^[11] and Giannopoulou *et al.* reported the same findings.^[14] However, different samples of adults reported experiencing the peak of separator pain on day 2^[13] or day 3.^[15] The decline in the perceived pain was evident in the current study after the 2nd day, and the decline continued with a few patients after the 4th day. This tendency toward a reduction in the average pain intensity and the number of patients experiencing pain was in agreement with many studies that investigated pain experiences associated with orthodontic treatment.^[9,12,21,24,25]

In this study, the gender difference did not statistically influence pain perception. However, more female patients reported feeling pain on the 3rd day until the 7th day. Beck *et al.* also reported a similar finding, with no significant difference in the pain level felt in the first 48 h following separator placement in adults.^[6] Several other studies found no difference in pain perception between males and females.^[9,13,24,26,27] However, other studies in the orthodontic literature confirmed the correlation between gender and pain perception, with girls reporting higher pain scores than boys.^[5,7,12,21,28,29] Variations in the studies' sample sizes, participants' ages, treatment interventions, and methods of pain measurement can explain the differences in the reported effect of gender on pain perception. Because of the contradictions between these studies, one cannot draw conclusions about the role of gender as a predictor of the pain experience in orthodontics.

The individual variations in the pain perception observed in this study confirm the previously published responses to

orthodontic procedures such as separator placement and insertion of initial archwires.^[13,22,24] Chewing was the most painful experience among the three studies' parameters. This was in agreement with the results of Bondemark *et al.*, who found that eating was the most affected activity during the separation study period.^[13] Scheurer *et al.* also reported that the influence of fixed orthodontic appliances on eating/chewing was significantly higher than the influence on daily life.^[21] Bondemark *et al.* showed that the effect of separator placement on leisure activities was small.^[13]

Several studies have investigated the reasons for the variable levels of pain reported during orthodontic treatment in patients of the same sex, race, and age. Beck *et al.* found that dental anxiety and pain catastrophizing significantly influenced the pain level reported after the insertion of orthodontic separators.^[6] Psychological factors such as previous traumatic experience have also been linked to perceived pain levels and patient adaptation to discomfort.^[24,30,31] Patients' expectations concerning pain and anxiety were correlated with the perception and the level of reported pain.^[1,8] However, personality traits were not associated with pain perception and cannot serve as a predictor of a patient's compliance during orthodontic treatment.^[5,32] Firestone *et al.*^[1] and Bergius *et al.*^[12] reported that the patients' perceptions of the severity of their malocclusions were not related to their feeling of discomfort during orthodontic treatment; this disagrees with the findings of Sergl *et al.*, who reported that patients who perceive their orthodontic irregularities as severe report less pain.^[4]

CONCLUSION

Pain due to orthodontic separator placement varies among adolescent patients, but it decreases significantly after the first 2 days. No significant difference in the perception of pain was found between male and female adolescent patients.

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Conflicts of Interest

There are no conflicts of interest.

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