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Pain Perception and Discomfort after Placement of Fixed Orthodontic Appliances

Research Article

Abdulrahman Alshammari[1*], Naif Alamer[2], Ayed Alzuayzi[2], Nasser Alateeq[3], Mohammed Alsaleh[4]

[1] University of Ha'il, College of Dentistry, Preventive Department, Division of Orthodontic, Hail, Saudi Arabia.
[2] General Dentist, Hail, Saudi Arabia.
[3] Ministry of Health, Riyadh, Saudi Arabia.
[4] University of Ha'il, College of Dentistry, Restorative Department, Division of Prosthodontics, Hail, Saudi Arabia.

Abstract

Aims: To investigate the patient pain experience and discomfort following placement of fixed orthodontic appliances, and evaluate the contributing and relieving factors for this pain.
Background: Patient discomfort and pain are important considerations at the outset of orthodontic treatment. They can negatively affect compliance and in certain cases, contribute to treatment avoidance. Various pain relief methods are available for orthodontic pain, including chewing gum and paracetamol. Nevertheless, relatively few studies have comparatively examined their efficacy.
Material & Methods: 92 patients (47 female and 45 male) aged 12 years and above were recruited from private-sector and public-sector orthodontic clinics. 13-item questionnaires were used to gather demographic data, to assess pain and its causes (e.g., site of pain, frequency, and severity), and to learn about the patients use of pain relief medications.
Results: 84.8% experienced pain following the insertion of a braces, and the pain was most often felt in the evening when compared to the morning ($p < 0.05$). 47.8% of the patients took at least one type of pain relief medication to mitigate their pain and discomfort.
Conclusion: In view of the finding that 84.8% of the patients included in this study experienced pain following the placement of a fixed orthodontic appliance, it is important for further studies to explore novel and effective ways to relieve pain in the population.
Clinical Significance: Orthodontic pain is not uncommon in Orthodontic practice and this pain can be relieved by over counter pain killer.

Keywords: Orthodontic Pain; Over-Counter Pain Killer; Visual Analogue Scale; Fixed Appliances; Discomfort.

Introduction

With improper function and appearance of the teeth, orthodontic treatment often becomes necessary [1]. However, before receiving orthodontic treatment, patient anxiety over the level of discomfort and pain they experience can represent major concerns [2]. In certain cases, this can reduce compliance, while in other cases can lead to the avoidance of treatment [3]. Approximately 8% of patients who have ended their treatment draw attention to pain as the primary contributing factor [4].

Oedema, ischemia, and inflammation in the compressed periodontal ligaments are the main causes of orthodontic pain [5]. Hyperalgesia of the periodontal ligament is a disorder that arises when continuous pushing occurs almost immediately following the placement of an arch wire. A well-documented relationship exists between periodontal ligament pain and prostaglandin, where prostaglandin has been found to contribute to hyperalgesia by increasing the level of sensitivity to noxious agents (e.g., serotonin, acetylcholine, substances P, bradykinin, and histamine). Agents of this kind change the nature of the blood flow to the periodontal ligament [6].

***Corresponding Author**:
Dr. Abdulrahman Alshammari,
Assistant Professor, Consultant Orthodontist, University of Ha'il, College of Dentistry, Preventive Department, Division of Orthodontic, 55424 Hail, Saudi Arabia.
Tel: +966598092207
E-mail: Abra.alshammari@uoh.edu.sa

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Patients typically experience pain in the initial two hours following the application of orthodontic force, and this increases over time. It tends to become most severe during the night and morning of the second day following treatment, after which it reduces for a period of 3-7 days [6-11]. Various studies have reported that discomfort and pain are the least favourable dimensions of orthodontic treatment [12]. For 91% of patients in one study, pain and discomfort were experienced after the placement of a fixed appliance, while 39% reported discomfort on each session involving the activation and changing of arch wires [13]. In Scheurer et al.'s study, 65% of the patients experienced pain after 60 minutes, while 95% experienced pain after 24 hours [14]. 25% of the included patients still felt pain after 7 days. In view of these findings, it is clear that orthodontists should take concrete and evidence-based measures to mitigate pain following the insertion of fixed orthodontic appliances.

Over the counter analgesics (OTCs), including non-steroidal anti-inflammatory drugs (NSAIDs) (e.g., aspirin and ibuprofen) and paracetamol, constitute the most prevalent type of pain relief. In contrast to paracetamol, which owes its pain relief function to the inhibition of cycloxogenase-3 in the spinal cord and brain, NSAIDs operate in a peripheral manner through the inhibition of prostaglandin synthesis [15, 16]. The literature indicates that it is possible to prescribe ibuprofen and paracetamol before and after the activation of an orthodontic appliance, both of which are associated with effective pain relief [17, 18].

The objective of this study was to evaluate the number of patients presenting with complaints about discomfort and pain following the placement of fixed orthodontic appliances for the first time, and to understand the contributing and relieving factors for this pain.

Materials and Methods

As a cross-sectional, survey study, the ethical approval was sought and granted from Ethical Committee to undertake the research #H-2019-019 . The participants were patients from private-sector and public-sector orthodontic clinics . The inclusion criteria were as follows: not taking any chronic medications; at least 12 years old; receiving treatment for a fixed orthodontic appliance; and previous medical history indicating good health. No patients were excluded based on the types of brackets, arch wire ligation approaches, and type of aligning wires used. Patients who satisfied the inclusion criteria were informed about the study's objectives and process using both written and oral means. Each patient was asked to sign a consent form before participating.

Population and Sampling

The target population in this study were patients attending private-sector or public-sector orthodontic clinics between September 2018 and February 2019. A minimum required sample size of 100 participants was decided based on a previous study, which had a sample size of 82 [11], and the recognition that sample attrition may reduce the number of participants over time.

Data Collection

The survey instrument, a 13-item questionnaire, was written in Arabic and evaluated in terms of content and face validity. The first section of the questionnaire collected information from the participants about their gender and age, while the second section focused on the frequency, severity, and site of pain. The visual analogue scale (VAS) was used to measure pain severity. The VAS format consists of a 10 cm horizontal unmarked line between two end-point of pain with 0 cm indicating no pain and 10 cm indicating intolerable pain. Finally, the third section of the questionnaire asked the patients to note down whether or not they took analgesics and which medication types they used.

Data Analysis

Descriptive statistics were used to analyse the data from the first part of the questionnaire, while independent t-tests and the chi square test for independence were applied to analyse the rest of the data. A p-value of less than 0.05 was regarded as statistically significant. The data analysis process was conducted using SPSS v. 25 (SPSS Inc. Chicago, USA).

Results

92 participants from the original 100 completed the questionnaire (45 male, 48.9%, and 47 females, 51.1%). 69.6% (n = 64) were aged over 18 years, while 30.4% (n = 28) were aged 12-18 [Table 1].

Pain Perceptions

84.8% experienced pain following the placement of braces, while 15.2% did not experience pain [Figure 1]. The mean VAS score was 5.646, and the standard deviation was 2.835. 29.3% (n = 27) of the patients felt the most pain in the period from 4 to 8 hours following the placement of the braces, while 26.1% (n = 24) ex-

Table 1. Baseline demographic characteristics of subjects who completed the study.

Participants demographics			
Classification		**n**	**%**
Gender	Male	45	48.9
	Female	47	51.1
	Total	92	100
Age	12-18 years	28	30.4
	18 years and above	64	69.6
	Total	92	100

perienced the most pain between 1-4 hours. 17.4% (n = 16) and 15.2% (n = 14) experienced the most severe pain after 8-24 hours and during the second day, respectively [Figure 2]. 40.2% and 54.3% experienced the most pain in the morning and evening, respectively, while 5.4% experienced the most pain during both the morning and the evening [Figure 3]. Finally, as shown in [Table 2], 55.6% and 10.1% of the participants experienced an increase in pain after chewing with the anterior and posterior teeth, respectively, and 14.1% experienced an increase in pain with speech.

Use of Analgesics

52.2% and 47.8% did not take painkillers or took at least a single type of pain killer, respectively. 39 patients used medication in total, 46.2% (n = 18) of whom used NSAIDs, 38.5% (n = 15) paracetamol, and 7.7% (n = 3) both. Additionally, 7.7% (n = 3) of the patients used other medication, and 5 of the participants did not write down the name of their medication [Figure 4].

Pain Value by Sector (Public and Private)

No significant difference was observed between the public and private sectors in terms of the VAS scale ($p > 0.05$). Additionally, no relationship was observed between the type of sector and the use of painkillers ($p = 0.8$).

Discussion

In this survey study, 84.8% of adolescent and adult patients indicated that they experienced pain following the placement of a fixed orthodontic appliance, consistent with other study [19]. 87% stated that they experienced pain during the study period, which is comparable to findings reported elsewhere in the literature. For example [13], reported that 91% of patients experienced different levels of discomfort after the placement of a fixed orthodontic appliance. In the study conducted by [14], 65% of the patients reported the onset of pain after 60 minutes, while 95% experienced pain after 24 hours. 25% of the patients still felt pain within 7

Figure 1. Shows 84.8% of the sample felt pain after having the braces while 15.2% didn't feel any pain after fixed appliances installed.

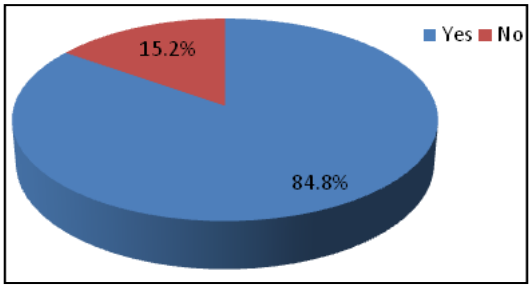


Figure 2. Showing the maximum pain felt after bracket installed.

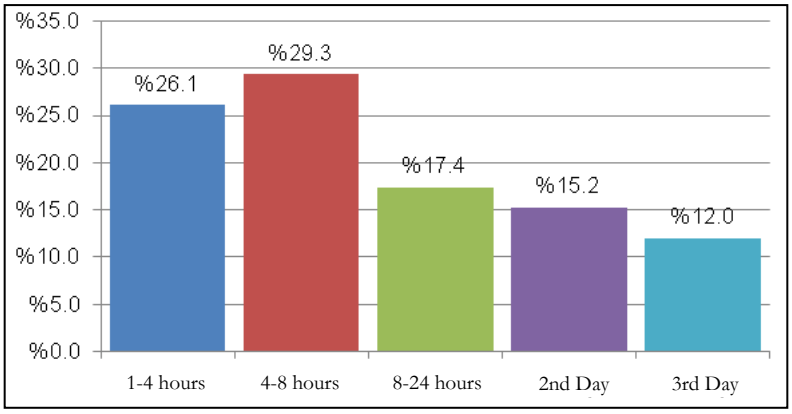


Figure 3. Shows 54.3% of patients felt the worst pain at evening, 40.2% at morning and 5.4 % both.

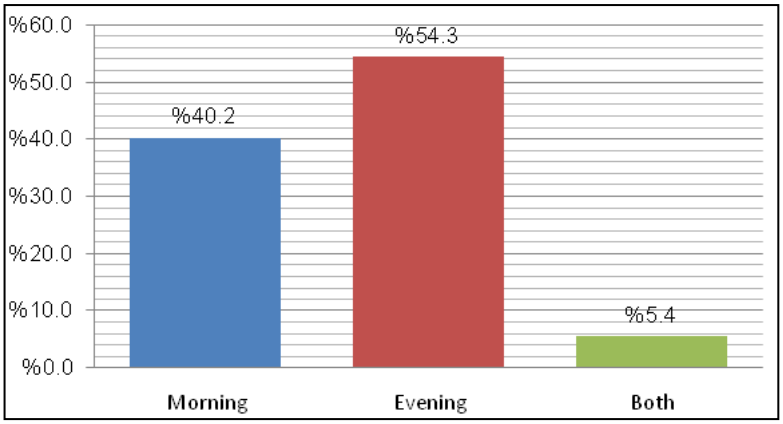
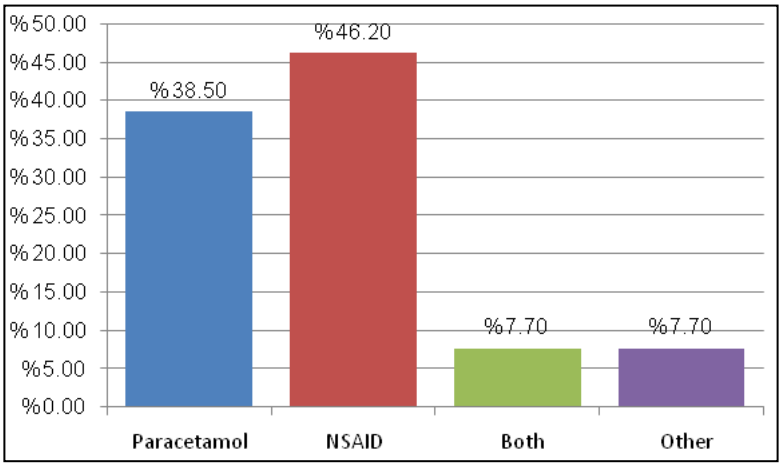


Table 2. Shows 55.6% of 99 responsesthat the chewing increases the pain, 20.2% (ant. biting), 14.1% (speech) and 10.1% (post. Biting).

	N	%
Chewing	55	55.60%
Ant. Biting	20	20.20%
Post. Biting	10	10.10%
speech	14	14.10%
Total	99	100.00%

Figure 4. Shows 46.2% of 39 responses take NSAID and 38.5% Paracetamol.



days.

In this study, the mean VAS score was 5.6 ± 2.8, which reflects the low-to-moderate levels of pain that are typically experienced in routine orthodontic settings. This result is comparable to several reported elsewhere in the literature, which have indicated that the VAS score was not greater than 5.2 [20] or 4.9 [21].

Although 26.1% of the patients experienced the most severe pain between hours 1 and 4 after brackets bonding, 29.3% experienced the most severe pain between hours 4 and 8. In turn, the proportion of patients experiencing the most severe pain began to decline (17.4% after 8-24 hours, 15.2% on the second day, and 12% on the third day). These results are consistent with those reported elsewhere in the literature [6-11, 20-22], which indicate that the onset of pain intensity occurs in the first two hours following the application of orthodontic force, after which it tends to increase until the night and morning of the second day, and subsequently decline.

In this study, patients experienced an increase in pain during mastication (55.6%), biting with the anterior and posterior teeth (20.2% and 10.1%, respectively), and speaking (14.1%). This is consistent with [14], which indicated that the patients' pain intensity scores were greater for the anterior teeth when compared to the posterior teeth during biting. However, dissimilar to this study's results [14], reported that incising food resulted in a slightly higher level of pain when compared to chewing. Additionally, [10] reported consistent results in finding that 33% of patients reported pain while eating on the first day following the placement of orthodontic device, and 71% of patients had to change their food consistency (which subsequently decreased on a daily basis). 52.2% of this study's patients did not take medications for pain relief, whereas 47.8% took at least one types of painkiller. One way to account for this result is that, given the generally low severity of the pain arising from routine orthodontic treatments, most patients do not require pain relief medications. In the study conducted by [20], the impact of acetaminophen, ibuprofen, and lactose were the same as a placebo in lowering pain following the initial placement of an orthodontic appliance. The researchers also reported that the mean VAS score was less than 5.2. In [14], the researchers found that most patients did not require painkillers following the placement of the orthodontic appliance, and that analgesic consumption declined following the third day after treatment. In [19], the researchers reported that 27% of the participants used analgesics to relieve pain following separator placement, and since 87% reported pain, this indicates low pain intensity.

In this study, NSAIDS were used by 46.2% (n = 18), while paracetamol was used by 38.5% (n = 15). Additionally, 7.7% (n = 3) of the patients used both types of analgesics. Comparing these results directly against those reported elsewhere in the literature is not possible due to the differences in study designs, as well as the pain management methods used.

Finally, heterogenous bracket systems constitute a noteworthy limitation of this study, and this is also the case for the aligning arch wires used in each of the research settings. However, different clinics were incorporated into the study to increase the representativeness and generalisability of the results.

Conclusions

84.8% of the included patients (n = 92) experienced pain following the installation of a fixed orthodontic appliance, and 55.6%

experienced an increase in pain on mastication. 54.3% experienced the most severe pain during evenings as opposed to mornings, and NSAIDs were associated with the greatest utility in relieving pain for 46.2% of patients.

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