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Chewing gum for pain control following orthodontic separator placement

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ABSTRACT

Objective: The objective was to compare the mean decrease in pain score in ibuprofen versus chewing gum groups after orthodontic separator placement.
Methods: The study was conducted at the Department of Orthodontics Dental Section-Faisalabad Medical University and de'Montmorency College of Dentistry, Pakistan. A total of 120 patients were selected according to the inclusion criteria and placed into ibuprofen and chewing gum groups (60 each group) using the random number table method. Patients were asked to complete a Visual Analog Scale (VAS) performa, at baseline (i.e., before separator placement), immediately after separator placement, at 2 hours, at bedtime (i.e., 12 hours), at 24 hours, at the second day, the third day, fifth day, and seventh day, after the separator placement. For analyzing the significance of the mean decrease in VAS scores between the two groups, the *t* test was applied.
Results: At each point of follow-up, chewing gum showed a similar decrease in mean pain score in comparison with ibuprofen ($P > 0.05$).
Conclusion: Chewing gum can be recommended for orthodontic pain control associated with elastic separator placement and is found to be as effective as using ibuprofen.

1. Introduction

Pain is a common experience in orthodontic patients especially after separator placement before molar banding and initial archwire placement [1,2]. Patients often rank pain as one of the worst aspects of orthodontic therapy and the major reason for discontinuing their orthodontic treatment care [3]. Some patients even reported the incidence and the severity of orthodontic pain greater than the pain of tooth extraction [4].

Many factors have been found to affect orthodontic pain, namely, amount of orthodontic forces, age, gender, the degree of malocclusion, and patient's psychological status [5,6]. There are different theories that are suggested in the literature regarding the mechanism of orthodontic pain generation. The most acceptable theory is that orthodontic pain arises by the combination of periodontal ischemia, compression, inflammation, and edema [5]. Some studies also attributed orthodontic pain to the hyperalgesia of the periodontium.

Pain after orthodontic separator insertion is usually felt within a few hours and reaches maximum levels 24 hours [7]. Nonsteroidal anti-inflammatory drugs (NSAIDs) in orthodontics have been reported to be the most successful pain control method [8,9]. However, studies have shown that NSAIDs cause interference in orthodontic tooth movement by blocking the synthesis of prostaglandins, and can also result in systemic side effects, such as gastrointestinal discomfort [10–11]. Therefore, various nonpharmacological methods have been recommended for orthodontic pain control such as low-level laser therapy, transcutaneous electrical nerve stimulation, vibratory stimulation of the periodontium, chewing gum, and bite wafers [12–16].

The most reliable method for measuring the perception of pain is the Visual Analog Scale (VAS) [17,18]. VAS is a psychometric pain response scale that can be used in orthodontic questionnaires. It is a measurement instrument for subjective characters such as orthodontic pain, which cannot be measured directly. When answering to a VAS, orthodontic patients specify their intensity of pain by marking a position along a calibrated straight line [17].

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The rationale of this study was to compare a non-pharmacological option of chewing gum with ibuprofen in orthodontic pain control following separator placement. The objective of this study was to compare the effect of ibuprofen and chewing gum on pain control after separator placement in terms of mean decrease in VAS score.

2. Materials and methods

After obtaining institutional ethical board approval and obtaining informed consent from patients, the study was conducted at the Department of Orthodontics Dental Section-Faisalabad Medical University and de'Montmorency College of Dentistry, Pakistan, from May 30, 2017, to May 30, 2018. The sample size was calculated after performing a power analysis, keeping in mind the past orthodontic studies on pain control.

Selection criteria were as follows: 13 to 17 years of age, irrespective of gender, scheduled for separators placement for molar bands, medically fit, without temporomandibular disorders, without psychological disorders, nonsmokers, not receiving any analgesic therapy, no contraindication to the use of ibuprofen, and no oral surgery in the previous 4 weeks. The reports on the influence of age and gender on pain following orthodontic therapy are inconsistent [19,20]. Therefore to control these factors, this study was limited to the age group of 13 to 17 years and stratification based on sex was used to balance the distribution of boys and girls in both the groups. A total of 120 patients were selected according to the selection criteria and placed into ibuprofen and chewing gum groups (60 in each group) using the random number table method. In both groups, elastomeric separators (3M Unitek, Monrovia, CA) were placed using separator pliers (Dentaurum, Springen, Germany) at the mesial and distal contacts of the maxillary first molars.

In the ibuprofen group, the patients received ibuprofen (400-mg tablets; Abbott Laboratories Ltd., Karachi, Pakistan) to be taken orally, 1 hour before separator placement and at 6-hour intervals. Patients in the ibuprofen group were specifically asked not to chew gum for the duration of the study. In the chewing gum group, the patients were prescribed to chew a sugar-free gum for 5 minutes (Wrigley's Orbit Complete; Wrigley Company, Chicago, IL) immediately after separator placement and at 8-hour intervals. The patients in both the groups were instructed and encouraged not to take any additional analgesics. If an additional medication was required, patients were asked to call the primary investigator and were instructed to document the frequency, dosage, and the type of medication taken. Of the 120 patients, none had taken additional medication. The number of separators placed and the time of placement was also documented in both the groups.

Patients responded to a VAS at baseline (i.e., before separator placement), immediately after separator placement, at 2 hours, at bedtime (i.e., 12 hours), at 24 hours, at the second day, the third day, fifth day, and seventh day after separator placement. When answering to VAS performa, patients were asked to specify their intensity of pain by marking a position along a calibrated straight continuous line weighted at both ends by descriptive terminology with a happy face and a sad face.

2.1. Statistical analysis

The normal distribution was analyzed by the Kolmogorov-Smirnov test. Age and VAS scores were presented by mean ± SD, whereas the variable of gender was presented by frequency and percentages. Mean decrease in VAS pain score was calculated by subtracting posttreatment VAS scores at all the follow-ups from pretreatment VAS scores. For analyzing the significance of the mean decrease in VAS scores between the two groups, *t* test was applied. Data were analyzed using SPSS version 21.0 (IBM Corporation, Chicago, IL) with a level of significance determined at $P \leq 0.05$.

3. Results

Preliminary analysis was done to find out the effect of sex on the significance of the mean decrease in VAS pain scores between the two groups. There was no effect of sex on the significance of the mean decrease in VAS pain scores between the two groups; therefore, this variable was eliminated from future analyses and the subsequent analyses were conducted. There was no significant difference between the two groups, in the number of separators placed and the time of placement. Of the 120 patients, none had taken additional medication. Normal distribution of the data was confirmed by the Kolmogorov-Smirnov test.

The average age at enrollment for the 60 subjects randomized to the ibuprofen group was not significantly different from that of the 60 subjects in the chewing gum group (ibuprofen, mean = 15.5, SD = 2.0; chewing gum, mean=15.6, SD=1.8) (Table 1). Gender distribution is also shown in Table 2.

At each point of follow-up, the chewing gum group showed a similar decrease in mean pain score at each follow-up, in comparison with the ibuprofen group (Tables 3 and 4).

4. Discussion

This study was designed to compare the effect of ibuprofen and chewing gum on orthodontic pain control by measurement of the mean decrease in VAS pain score following separator placement. A recent clinical trial showed that chewing gum use had no significant effect on the number of appliance breakages [21,22].

The results of this study show that in both the groups, the score of pain increased immediately after separator placement, lessened 2 hours later, increased at night (i.e., 12 hours), peaked at 24 hours and then decreased thereafter through 7 days after separator placement. This pain trend was similar to that seen in previous studies that reported peak pain after 24 hours of orthodontic therapy linked with the peak level of prostaglandins [23–25].

Pain following separator placement can be attributed to the combination of compression, ischemia, periodontal inflammation, and edema [15]. Orthodontic pain mainly arises due to an inflammatory reaction in the periodontium, while peak level of prostaglandins and other pain mediators in gingival crevicular fluid stimulates a pain response [15,16]. NSAIDs such as ibuprofen suppress the production of prostaglandins and thus decreases inflammatory reactions [10].

The mean decrease in VAS pain score following separator placement showed that chewing gum was as effective as ibuprofen

Table 1
Age distribution in both the groups

	Ibuprofen group, n = 60		Chewing gum group, n = 60		Total, n = 120	
Age groups, y	13–15	16–17	13–15	16–17	13–15	16–17
Numbers (%)	34 (56.66)	26 (43.33)	35 (58.33)	25 (41.66)	65 (54.16)	55 (45.83)
Age, y, mean ± SD	15.50 ± 2.00		15.60 ± 1.80		15.55 ± 1.90	

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