

Effect of Chewing Gum on Pain in Fixed Orthodontic Treatment

Meral Nadeem¹, Jawaria Tariq², Muhammad Abdullah Kamran³,
Verda Mahroof⁴, Raza Siddique⁵, Farwa batool⁶, Irfan Qamruddin⁷

Abstract

Objective: To assess the intensity of orthodontic pain with and without the use of chewing gum during fixed orthodontic treatment in two groups of patients presenting at the Orthodontic Department of Liaquat College of Medicine and Dentistry, Karachi.

Methods: The study was conducted at the Orthodontic Department of Liaquat College of Medicine and Dentistry, Karachi, Pakistan. The sample population of this study was thirty adult patients who were planned to initiate fixed orthodontic appliance treatment. In this study, a parallel group clinical trial was conducted with two analogous groups, one was asked to chew gum following orthodontic bracket placement and second was asked not to chew gum. Up until the working wire was placed, the patients filled a questionnaire of Impact of Fixed Appliances after 24hrs and 1week. In order to analyze the intensity of pain, a visual analogue scale (VAS) was used.

Results: At the initial 24hrs, among both chewing gum and non chewing gum groups, the difference in median Total Impact Score was 2, which means there was considerable difference ($p=0.034$; Mann-Whitney U test). Whereas, the median difference of VAS among the two groups at 24 hours was also 2, also depicting there was considerable difference ($p=0.03$; Mann-Whitney U test). However, after 1 week, there was no significant difference in both groups.

Conclusion: Both the pain and impact of fixed orthodontic appliance was reduced by using chewing gum.

Keywords: Orthodontics, pain, chewing gum, orthodontic appliances

IRB: Approved by Ethics Committee of Liaquat College of Medicine and Dentistry. Dated: 25th May 2015.

(ASH & KMDC 21(2):94;2016).

Introduction

There is evidence to suggest that in both adolescent^{1,2} and adults fixed orthodontic appliances cause worsening³ of the oral health, especially following the first month after placement⁴. Fixed orthodontic appliance is also associated with functional, physical, social discomfort⁴ and pain^{5,6}. As a result, the patient compliance is badly affected and ultimately causes failure to complete

treatment. Generally, systemic analgesics have been used as the mostly prescribed process of pain management from fixed orthodontic appliances⁷⁻⁹. A study conducted in Turkey, in 2005, revealed the role of non steroidal anti inflammatory drugs in reducing pain during orthodontic therapy¹⁰. Another study conducted in 2010 elaborated the role of pharmacological drugs in reducing orthodontic pain¹¹.

However, there are certain non-pharmacological techniques being employed as well, such as lasers and Transcutaneous Electrical Nerve Stimulation (TENS)¹²⁻¹³. Although, a study published in 2015, emphasizes on the role of the use of chewing gum which also appears to have a decrease in orthodontic pain during fixed therapy¹⁴.

Department of Orthodontics

^{1-2,4-7} Baqai Medical University

³ Liaquat College of medicine and dentistry

Correspondence: Dr. Abdullah Kamran

Department of Orthodontics

Liaquat College of Medicine and Dentistry

Email: mak14aug@hotmail.com

Date of Submission: 4th March 2016

Date of Acceptance: 10th May 2016

There has been an enhanced pulpal sensory threshold to electrical stimulus by the process of chewing¹⁵. There is also evidence which suggested that chewing not only increases the blood flow in and around the periodontal membrane, but also lymphatic circulation is restored with inflammation and oedema relief^{16,17}. It means that patients having use of chewing gum may experience decrease in pain as a result of decrease in inflammation, which occurs in response to fixed orthodontic therapy.

Unfortunately after in depth search of local data the role of non analgesic agents especially chewing gum is not available. Therefore, this study was planned with the rationale to assess the intensity of orthodontic pain after the use of chewing gum during fixed orthodontic therapy, excluding other causes of dental pain, which is a cheap and readily available option for the patients.

Patients and Methods

Ethical approval for this study was obtained from Ethical committee of Liaquat College of medicine dentistry. There was an informed written consent taken from all participants or their guardians before they took part in the research.

On the basis of the design, the study was a parallel group clinical trial having two analogous groups. The sampling technique was probability simple random sampling. The sample size calculated by Raosoft soft ware with margin of error of 5%, confidence level of 95%, population size of 3014 and response distribution of 50%. The calculated sample size was 28, so we selected 30 patients in each group¹⁴. The location of the research was orthodontic department Liaquat College of Medicine and dentistry, Karachi, Pakistan. This six-month study was conducted from the month of June 2015 to December 2015.

The inclusion criteria of the participants were adults, 18 to 24 years, young and healthy patients who were about to undergo fixed orthodontic treatment and having no evident cause of odontogenic

pain. Exclusion criteria were cleft lip, cleft palate or both anomalies in the patients, Phenylketonuria patients (as they cannot consume aspartame or other synthetic sweeteners which contain phenylalanine, which is present in chewing gum), patients with a significant medical history, and patients with lack of proper dental or periodontal health i.e. having bad oral hygiene, patient taking alcohol, smoking and tobacco users were also excluded.

The participants were randomly divided into two groups:

Chewing Gum (CG): Provided chewing gum at the bonding/separator stage till the working arch wire (0.017×0.025 stainless steel) placement.

Non-chewing Gum (NG): Specially told not to have a chewing gum during the study.

Randomization was carried out by flip of coin method. It was not possible to mask the patient during group allocation because either they were asked to chew gum or not. The treatment of the patients was conducted by employing standard treatment mechanics, which started with the initial arch wire for alignment, round nickel-titanium (0.014-inch). A rectangular nickel-titanium (0.017 x 0.025-inch) was placed once alignment was achieved; subsequently a rectangular stainless steel (0.017 x 0.025-inch) was placed. The patients were requested to keep a record on their diary following each visit up to and till the rectangular stainless steel was placed. This diary contained a formerly authenticated Impact of Fixed Appliances (IFA) which includes aesthetic impact, functional limitations, dietary impact, oral hygiene limitations, maintenance impact, physical impact, social impact, time constraints, travel/ cost implication¹⁸. Feedback form intended to compute a fixed appliance impact on the everyday life of a patient. In this IFA form, there was one universal question with 32 general questions regarding impact of different factors during fixed appliance therapy. There is a 5 point scale for the response options ranging from 1 (strongly disagree) to 5 (strongly agree). In the end, in general Total Impact Score (TIS).¹⁹ The patients

were also provided by a compliance sheet in which they have to maintain the record of their use of chewing gum twice daily.

The CG group participants were requested to use the chewing gum twice daily (morning and evening), and maintain their compliance sheet. However, before filling in their diary they were especially asked to chew gum for 10 minutes. Then they had to maintain their compliance sheet that was regularly checked by the researcher. The participants had to take their diary home fill it following 24 hours and 1 week of appliances placement or correction. Moreover, in order to record the amount of pain experienced by patients, they were asked to mark it on a 10 mm visual analogue scale (VAS)²⁰

On the left side of the VAS scale was written "my teeth are painless" and "my teeth pain a lot" was written on the scale's right side. The CG group patients also had to indicate the amount of gum they were consuming. Another portion in the diary after the impact questions was the comments box in which patients had to describe on the duration, frequency and feel of pain. The patients recorded their experience on the proforma.

All the data was recorded and analyzed statistically using SPSS 20.00 with the statistical significance set at $p < 0.05$. Both at 24 hours and 1 week, determination of VAS was done. For trends, the difference in frequencies among NG and CG groups was determined using the chi-squared test. Both TIS and VAS distributions were not found to be standard; hence with the help of a non-parametric Mann Whitney U test, differences among the median scores recorded by both groups at 24 hours and 1 week were tested.

Results

Recruitment and randomization of thirty patients in each group was done. In the study, overall there were 16 males and 14 females in the chewing gum group and 13 males and 17 females in non chewing gum group. Most patients were in the age of 22-24 years in both groups (Table 1).

Total Impact Scores (TIS) revealed that the median TIS at 24 hours was 7 (range 2-8) for the NC group and for the CG group, it was 5 (range 2-7), which was considerably different ($p=0.034$; Mann-Whitney U test). For the NC group at the 1st week, the median TIS was 7 (range 2-8) and 6 (range 2-6) for the CG group, which was not considered drastically different ($p=0.02$; Mann-Whitney U test). Table.1 (nonparametric test was used because Shapiro wilk test for normality showed asymmetrical (skewed) data

Visual Analogue Scores (VAS) showed that the median VAS for the NC at 24 hours was 4mm (range 0-8 mm) while for the CG was 2 mm (range 0-8 mm), depicting increased significance ($p=0.03$; Mann-Whitney U test). In the NC group after 1 week, median VAS was 2mm (0-6mm) whereas the CG group was 9 mm (range 0-9 mm) depicting significance ($p=0.01$; Mann-Whitney U test) (Table 2).

Discussion

Very little research is available regarding the effect of chewing on fixed orthodontic appliances and whether it decreases pain. This parallel group clinical trial was one of the foremost studies, which employed Mandall et al's impact questionnaire to determine how chewing gum drastically reduced the pain sensation of fixed orthodontic treatment²¹. In our study the median TIS at 24 hours was 7 (range 2-8) for the NC group and 5 (range 2-7) for the CG group, it was, which was considerably different ($p=0.034$; Mann-Whitney U test). This is not in consistent with the study conducted at University of Shieffield which revealed that at 24 hours the median TIS was 89 (range 32-130) for the NC group and 73 (range 39-145) for the CG group, which was significantly different ($p=0.031$; Mann-Whitney U test)²².

At 1 week the median TIS was 78 (32-130) for the NC group and 70 (range 36-148) for the CG group, which was not significantly different ($p=0.185$; Mann-Whitney U test). At 1 week the median TIS was 78 (32-130) for the NC group and 70 (range 36-148) for the CG group, which was not sig-

Table 1. Percentage distribution of patients in chewing gum and non chewing gum groups

| Age group | Chewing gum group n (%) | Non chewing gum n (%) |
|-----------|----------------------------|--------------------------|
| 18-20 | 5 (16.6) | 6 (20) |
| 20-22 | 7 (23.3) | 5 (16.6) |
| 22-24 | 18 (60) | 19 (63.3) |

Table 2. Showing VAS and TIS values after 24 hours and 1 week in both groups

| | Chewing group Median + SD | Non chewing group Median + SD | Difference | p-value |
|-----------------|------------------------------|----------------------------------|-------------|---------|
| VAS (24 hours) | 2.76 ± 0.65 | 5.88 ± 0.87 | 3.12 ± 0.22 | 0.03 |
| TIS (24 hours) | 2.03 ± 0.55 | 4.89 ± 0.77 | 2.86 ± 0.22 | 0.34 |
| VAS (1 week) | 1.89 ± 0.42 | 6.00 ± 0.55 | 4.11 ± 0.13 | 0.01 |
| TIS (1 week) | 1.55 ± 0.30 | 5.55 ± 0.40 | 4 ± 0.1 | 0.02 |

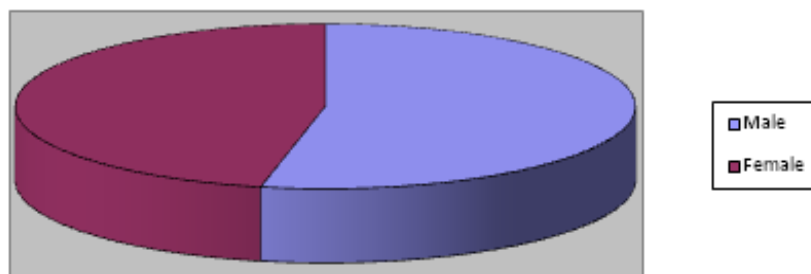


Fig.1. Showing gender distribution among two group

nificantly different ($p=0.185$; Mann-Whitney U test)²³.

For the NC group at the 1st week, the median TIS was 7 (range 2-8) and 6 (range 2-6) for the CG group, which was not considered drastically different ($p=0.02$; Mann-Whitney U test).

Fixed appliance had a prevalent impact on the life of adolescents. In our study the median VAS for the NC at 24 hours was 4 mm (range 0-8 mm) while for the CG was 2 mm (range 0-8 mm), depicting increased significance ($p=0.03$; Mann-Whitney U test) while in study conducted at University of Sheffield¹⁹ shown that at 24 hours the median VAS was 45 mm (range 0-84 mm) for the NC group and 20 mm (range 0-87 mm) for the CG group, which was significantly different ($p=0.038$; Mann-Whitney U test).

In the NC group after 1 week, median VAS was 2mm (0-6 mm) whereas the CG group was 9 mm (range 0-9 mm) depicting significance ($p=0.01$; Mann-Whitney U test). While in University of Sheffield, at 1 week the median VAS was 21mm (0-69 mm) for the NC group and 9 mm (range 0-91 mm) for the CG group, which was not significantly different ($p=0.255$; Mann-Whitney U test).

The impact of pain among NC and CG groups at 24 hours and 1 week were recorded. Generally, the peak pain time for patients is post 24 hours of fixed appliance appointment/modification and over the next week it is decreased²⁴⁻²⁵.

For prospective research, the further possible benefit of chewing gum such as enhancing salivary flow and maintaining an uncontaminated appliance for decreased demineralization would be an exciting opportunity. Further longitudinal studies with large sample size must be conducted in order to make the results more generalized. It is recommended that orthodontists should advise their patients to use chewing gum during fixed orthodontic therapy.

The limitations of the study were small sample size. Further longitudinal studies should be conducted to evaluate the role of chewing gum and other agents in reducing the pain during fixed orthodontic therapy. The potential source of bias is

patient's compliance for the use of chewing gum in CG and not to use chewing gum in the NG group during the study period. The patients are strictly advised to follow the regimen and maintain their compliance sheet as advised in order to control this bias.

Conclusion

Pain after fixed orthodontic therapy is an understood complaint experienced by the patient. However, the impact and pain of fixed orthodontic appliances was decreased by the use of chewing gum. This research may impose a valuable contribution for the orthodontic patients in alleviating pain during fixed Orthodontic therapy.

Conflict of Interest

Authors have no conflict of interests and no grant/ funding from any organization for this study.

References

1. Bernabe E, Sheiham A, Tsakos G, Messias de Oliveira CM. The impact of orthodontic treatment on the quality of life in adolescents: a case-control study. *Eur J Orthod* 2008; 30:515-520.
2. Zhang M, McGrath C, Hagg U. Changes in oral health-related quality of life during fixed orthodontic appliance therapy. *Am J Orthod Dentofacial Orthop* 2008;133:25-29.
3. Liu Z, McGrath C, Hagg U. Changes in oral health-related quality of life during fixed orthodontic appliance therapy: An 18-month prospective longitudinal study. *Am J Orthod Dento facial Orthop*.2011; 139:214-219.
4. Serogl HG, Klages U, Zentner A. Functional and social discomfort during orthodontic treatment--effects on compliance and prediction of patients' adaptation by personality variables. *Eur J Orthod* 2000; 22:307-15.
5. Scheurer PA, Firestone AR, Burgin WB. Perception of pain as a result of orthodontic treatment with fixed appliances. *Eur J Orthod* 1996; 18:349-57.
6. Krukemeyer AM, Arruda AO, Inglehart MR. Pain and orthodontic treatment. *Angle Orthod* 2009; 79:1175-81.
7. Bird SE, Williams K, Kula K. Preoperative acetaminophen vs ibuprofen for control of pain after orthodontic separator placement. *Am J Orthod Dento facial Orthop* 2007;132:504-10.

8. Bradley RL, Ellis PE, Thomas P, Bellis H, Ireland AJ, Sandy JR. A randomized clinical trial comparing the efficacy of ibuprofen and paracetamol in the control of orthodontic pain. *Am J Orthod Dentofacial Orthop* 2007; 132:511-7.
9. Kluemper GT, Hiser DG, Rayens MK, Jay MJ. Efficacy of a wax containing benzocaine in the relief of oral mucosal pain caused by orthodontic appliances. *Am J Orthod Dentofacial Orthop* 2002;122:359-65.
10. OmurPolat and Ali IhyaKaraman (2005) Pain Control During Fixed Orthodontic Appliance Therapy. *The Angle Orthodontist*: 2005;75:214-19.
11. Xiaoting LI, Yin T, Yangxi C. Interventions for pain during fixed orthodontic appliance therapy: A systematic review. *The Angle orthodontist*. 2010 Sep;80:925-32.
12. Roth PM, Thrash WJ. Effect of transcutaneous electrical nerve stimulation for controlling pain associated with orthodontic tooth movement. *Am J Orthod Dento facial Orthop* 1986;90:132-8.
13. Turhani D, Scheriau M, Kapral D, Benesch T, Jonke E, Bantleon HP. Pain relief by single low-level laser irradiation in orthodontic patients undergoing fixed appliance therapy. *Am J Orthod Dento facial Orthop* 2006;130:371-7.
14. Shedam, M. The Effect of Chewing Gum on the Pain Associated With Initial Placement of Fixed Orthodontic Appliances. *J Dent & Oral Care* 2015;1:1-5.
15. Kempainen P, Vaalamo I, Leppala N, Pertovaara A. Changes in tooth pulpal detection and pain thresholds in relation to jaw movement in man. *Arch Oral Biol* 2001;46:33-7.
16. Furstman L, Bernick S. Clinical considerations of the periodontium. *Am J Orthod* 1972;61:138-55.
17. Burt BA. The use of sorbitol- and xylitol-sweetened chewing gum in caries control. *J Am Dent Assoc* 2006;137:190-6.
18. Nagarajappa R, Ramesh G, Sandesh N, Lingasha RT, Hussain MAZ. Impact of fixed orthodontic appliances on quality of life among adolescents' in India. *J Clin Exp Dent* 2014;6:389-94.
19. Benson, P.E., Razi, R.M. and Al-Bloushi, R.J. (2012) The effect of chewing gum on the impact, pain and breakages associated with fixed orthodontic appliances: a randomized clinical trial. *Orthodontics & Craniofacial Research*, 15 (3): 178-187.
20. Benson PE, Razi RM, Al-Bloushi RJ. The effect of chewing gum on the impact, pain and breakages associated with fixed orthodontic appliances: a randomized clinical trial. *Am J Orthod Dentofacial Orthop* 2008;133:331-8.
21. Mandall NA, Vine S, Hulland R, Worthington HV. The impact of fixed orthodontic appliances on daily life. *Community Dent Health* 2006;23:69-74.
22. Otasevic M, Naini FB, Gill DS, Lee RT. Prospective randomized clinical trial comparing the effects of a masticatory bite wafer and avoidance of hard food on pain associated with initial orthodontic tooth movement. *Am J Orthod Dento facial Orthop* 2006;130:6-9-15.
23. Miller KB, McGorray SP, Womack R, Quintero JC, Perelmuter M, Gibson J, et al. A comparison of treatment impacts between Invisalign aligner and fixed appliance therapy during the first week of treatment. *Am J Orthod Dento facial Orthop* 2007;131:301-9.
24. Bergius M, Berggren U, Kiliaridis S. Experience of pain during an orthodontic procedure. *Eur J Oral Sci* 2002;110:92-8.
25. Erdinc AM, Dincer B. Perception of pain during orthodontic treatment with fixed appliances. *Eur J Orthod* 2004;26:79-85.