

A Comparison Between Molar Bands And Bondable Buccal Tubes Upon Periodontal Status Of Orthodontic Patients

Rahman MA*¹, Ghosh R², Rafique T³, Hasan MM⁴, Hasan MK⁵, Rahman MA⁶, Hassan GS⁷

¹Resident, Department of Orthodontics, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh

²Associate Professor, Department of Orthodontics, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh

³Assistant Professor, Department of Orthodontics, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh

⁴Lecturer, Department of Orthodontics, Shaheed Suhrawardy Medical College, Dhaka, Bangladesh

⁵Associate professor, Department of Orthodontics, Chattogram Maa-O-Shishu Hospital, Chattogram, Bangladesh

⁶Assistant Professor, Department of Orthodontics, Rangpur Medical College, Rangpur, Bangladesh

⁷Professor & Chairman, Department of Orthodontics, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh

*Corresponding Contributor: Dr. Md Azizur Rahman, Department of Orthodontics, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh. Email: marranaortho@gmail.com

ABSTRACT

Introduction: At the beginning of the fixed orthodontic appliances system all the teeth were banded. Following the introduction of acid etching of enamel, orthodontic brackets are now bonded routinely with resin adhesives to incisors, canines, and premolars as part of a fixed orthodontic appliances system. But molar bands remained as routine practice. The comparison of molar bands and bondable buccal tubes upon periodontal status during orthodontic treatment are currently being investigated more intensely. Our study was to compare molar bands with bondable buccal tubes upon the periodontal status of orthodontic patients.

Methods: This Non-randomized control clinical trial was conducted at the Department of Orthodontics, Bangabandhu Sheikh Mujib Medical University, Dhaka from the period of December 2016 to August 2017. The test sample was 40 molar teeth of 10 orthodontic patients who were selected consecutively from patients selected for fixed orthodontic treatment in BSMMU. The sampling technique was consecutive sampling. Data analyses were done using the Statistical Package for the Social Science (SPSS) for Windows (version 20; Armonk, NY: IBM SPSS corp.; 2011) and the graphical presentation was done on a personal computer.

Results: The patients were aged 13–22 years [Mean (SD) age =16.0±2.90 years]. The 20 molar teeth of the upper arch of selected patients were banded with molar bands (Group A). The 20 molar teeth of the lower arch of selected patients were bonded with bondable buccal tubes (Group B). All Critical assessments of periodontal status were taken at three different periods, at the start of the treatment (T1), at the follow-up at three months (T2), and at the follow-up at 6 months (T3). There was statistically no significant difference in the Bleeding on Probing (BOP) for molar bands from T1 to T2 (P=0.146) and T2 to T3 (P=0.375), but a statistically significant increase in Bleeding on Probing (BOP) for molar bands from T1 to T3 (P=0.034) was observed. The change in mean Probing Depth (PD) for molar bands and bondable buccal tubes was 0.42 mm and 0.05 mm respectively at 3 months follow up, whereas 0.57 mm and 0.07 mm respectively at 6 months follow up.

Conclusion: Based on the methodology applied in this study, and according to the results obtained and applied to the statistical analysis, it was considered reasonable to conclude that: Bondable buccal tubes were better than molar bands regarding the periodontal status of orthodontic patients.

Keywords: Molar bands, Bondable buccal tubes, Orthodontic patients, Periodontal status

Date of Submission: 26-08-2023

Date of Acceptance: 06-09-2023

I INTRODUCTION

At the beginning of the fixed orthodontic appliance system, all the teeth were banded. Following the introduction of acid etching of enamel¹, orthodontic brackets are now bonded routinely with resin adhesives to incisors, canines, and premolars as part of a fixed orthodontic appliance system^{2,3,4}. But molar bands remained as routine practice. In recent times, bondable buccal tubes are adopted in fixed orthodontic appliances system. Regarding gingival inflammation, studies show that the installation of orthodontic appliance increases the amount of plaque, which results in the formation of gingival hyperplasia and periodontal pockets^{5,6}. Gingival inflammation and hyperplasia may occur quickly after the placement of a fixed appliance such as orthodontic molar bands⁷, and the development of these problems appears to occur more commonly in interproximal sites and back teeth compared with front teeth⁸. There are four possible reasons behind this phenomenon increase in the gingival swelling related to molar bands⁹. Firstly, molar bands involuntarily irritate gingival tissues. Secondly, chemical irritation can occur as a reaction to the cement used to retain the band, which is in close vicinity to the gingival tissues. Thirdly, there is a greater risk of food impaction, and so posterior gingival and periodontal irritation may occur. Finally, patients may have a tendency to clean their front teeth more effectively than their back teeth. The use of bondable buccal tubes instead of molar bands should prevent or minimize periodontal changes as the bondable buccal tubes are positioned away from the gingival margins¹⁰. A trial assessed the difference between banded and bonded teeth regarding plaque accumulation, gingival inflammation, and loss of attachment¹¹. The additional advantages of using bondable buccal tubes over molar bands are mainly, the ability to maintain a large stock of various sized molar bands is unnecessary, a separation appointment is not needed and, the extensive pain associated with the separation visit does not occur¹². Therefore, all possible efforts should be made to reduce, and in the best case, prevent these potential treatment effects of molar bands, especially in medically compromised individuals^{13,14}. The comparison of molar bands and bondable buccal tubes upon periodontal status during orthodontic treatment are currently being investigated more intensely. By to our knowledge, no previous research regarding this topic was performed in this country. With this in mind, the study will be an endeavor to compare the periodontal status associated with molar bands and bondable buccal tubes during orthodontic treatment.

II METHODOLOGY

This Non-randomized control clinical trial was conducted at the Department of Orthodontics BSMMU, Dhaka from the period of December 2016 to August 2017. The test sample was 40 molar teeth of 10 orthodontic patients who were selected for fixed orthodontic treatment in BSMMU according to the following exclusion and inclusion criteria. A consecutive sampling technique was selected for the sample selection. At first 10 orthodontic patients were selected from patients who were selected for fixed orthodontic treatment in BSMMU & fulfilled the selection criteria. A lottery was performed for the selection of arch for banding and bonding in all patients, where upper arches were selected for banding and lower arches were selected for bonding. The banded teeth are grouped as A and bonded teeth are grouped as B. For the ease of data collection numbering of patients was done as 1 to 10. The instruments used in the study were presented in the pictures 1 through 4. Instruments used for attachment of the molar band have been shown in Picture 1 and 2. Instruments used for attachment of the bondable buccal tube have been shown in Picture 3 and 4. Picture 5 and 6 show the in-treatment photograph of the right lateral and left lateral respectively. The right molars of each group are numbered first and then the left molars sequentially for previously numbered patients i.e. the right molars of the 2nd patient were numbered as 3 for both groups. The 20 molar teeth of the upper arch of selected patients were banded with molar bands. Banding was done by Glass ionomer cement Type-I (GC Gold Label). 20 molar teeth of the lower arch of selected patients were bonded with bondable buccal tubes. Bonding was done by Adhesive after etching with 37% Orthophosphoric acid & then light-cured. P-value was considered significant at $p \leq 0.05$ with a confidence interval of 95%. Data analyses were done using the Statistical Package for the Social Science (SPSS) for Windows (version 20; Armonk, NY: IBM SPSS corp.; 2011) and the graphical presentation was done on a personal computer. Normality of the data was checked by Shapiro-Wilk and Kolmogorov-Smirnov test. Prior to the commencement of this clinical study, ethical approval by the Institutional Review Board (IRB) of BSMMU was taken.

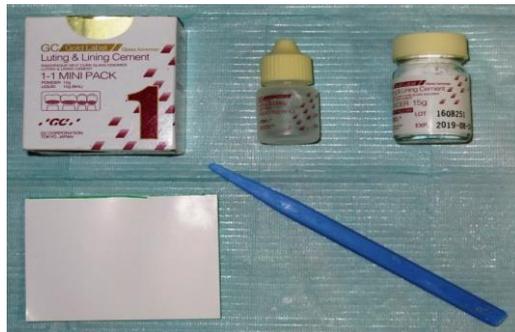
Inclusion Criteria

- Presence of full adult dentition
- No pre-existing periodontal disease
- Same oral hygiene status
- Available for data collection during the first 6 months of orthodontic treatment

Exclusion Criteria

- Patients requiring arch expansion
- Patients requiring auxiliary appliance

- Patients with systemic diseases
- Patients on antibiotics



Picture 1: Materials for attachment of molar band



Picture 2: Instruments for attachment of molar band



Picture 3: Materials for attachment of bondable buccal tubes



Picture 4 : Instruments for attachment of bondable buccal tubes



Picture 5: Intra-treatment photograph (Right lateral)



Picture 6: Intra-treatment photograph (Left lateral)

III RESULTS

The patients were aged 13–22 years [Mean (SD) age =16.0±2.90 years]. The 20 molar teeth of the upper arch of selected patients were banded with molar bands (Group A). Banding was done by Glass ionomer cement Type-I (GC Gold Label). The 20 molar teeth of the lower arch of selected patients were bonded with bondable buccal tubes (Group B) (Table I). There was statistically no significant difference in the BOP for molar bands from T1 to T2 (P=0.146) and T2 to T3 (P=0.375), but a statistically significant increase in BOP for molar bands from T1 to T3 (P=0.034) was observed. Statistically, no significant difference in the BOP for bondable buccal tubes from T1 to T2, from T2 to T3, and from T1 to T3 was observed (Table II). The change in mean PD for molar bands and bondable buccal tubes was 0.42 mm and 0.05 mm respectively at 3 months follow up, whereas 0.57 mm and 0.07 mm respectively at 6 months follow up. Statistically no significant difference in mean PD values between two groups at T1 (P=0.745), but a significant increase in the mean PD values were observed at T2 (P=0.027) and T3 (P=0.007) for molar bands (Table III). There was a statistically significant increase was observed in the mean PD values for molar bands from T1 to T2 (P=0.001), from T2 to T3 (P=0.001), and from T1 to T3 (P=0.030). Statistically, no significant change was observed in the mean PD values for bondable buccal tubes from T1 to T2 (P=0.163), from T2 to T3 (P=0.330) and from T1 to T3 (P=0.083) (Table IV). Data was presented as mean ± standard deviation and P-value was considered significant at p≤0.05 with a confidence interval of 95%.

Table I: Group identities. The arch and molar attachments used for each group.

Group	Arch	Molar Attachments	Number of sample
A	Upper	Molar bands	20
B	Lower	Bondable buccal tubes	20

Table II: Comparison of P Value of increase in BOP at different follow up between molar bands and bondable buccal tubes (n=40)

Comparison of BOP at different follow up	P Value	
	Molar bands	Bondable buccal tubes
BOP T1 vs BOP T2	0.146	-
BOP T2 vs BOP T3	0.375	-
BOP T1 vs BOP T3	0.034*	-

Table III: Comparison of mean PD between two groups at different follow up (n=40)

Follow up	Molar bands (n=20) Mean ±SD	Bondable buccal tubes (n=20) Mean ±SD	Mean change	P value
T1	2.68±0.49	2.73±0.47	0.050	0.745
T2	3.10±0.45	2.78±0.44	0.325	0.027*
T3	3.25±0.55	2.80±0.44	0.450	0.007*

Table IV: Comparison of P Value of increase in PD at different follow up between molar bands and bondable buccal tubes (n=40)

Comparison of PD at different follow up	P Value	
	Molar bands	Bondable buccal tubes
PD T1 vs PD T2	<0.001*	0.163
PD T2 vs PD T3	<0.001*	0.330
PD T1 vs PD T3	0.030*	0.083

IV DISCUSSION

In this study, the patients were aged 13–22 years [Mean (SD) age =16.0±2.90 years] about to begin orthodontic treatment with fixed appliances were included. The age group was chosen to obtain a standardized sample of patients who are likely to have a similar level of oral hygiene practice. Potential age-related differences in oral flora were also excluded. Several previous clinical trials^{8,11,15} revealed that molar bands caused bleeding when probing the buccal surfaces of the molars compared with bondable buccal tubes. In this study molar bands were associated with statistically no change in the BOP in 3 months follow-up but an increase in the BOP in 6 months follow up where no change in the BOP in case of bondable buccal tubes in both 3 and 6 months follow

up. The findings clearly confirm that molar bands cause statistically more bleeding on probing (BOP) than bondable buccal tubes. This might be explained by factors such as the involuntary irritation caused by bands⁹, which are likely to be in contact with the gingival margin. In the current study, the PD significantly increased in the banded teeth and did not significantly change in bonded teeth. The change in mean PD for molar bands and bondable buccal tubes was 0.42 mm and 0.05 mm respectively at 3 months follow up, whereas 0.57 mm and 0.07 mm respectively at 6 months follow up. Bondable buccal tubes are more secluded from the gingival tissues and can influence the nominal change in PD observed in bonded teeth. A clinical and microbiological study showed that an increase in PD occurred following the placement of the molar band; however, the plaque index and gingival index remained unaffected¹⁶. Indeed, an early study suggested that gingival hyperplasia dramatically diminished within forty-eight hours following appliance removal and continued to decrease during the first four months of retention¹⁷. The changes in PD were also different between molar bands and bondable buccal tubes. In comparing molar bands to bondable buccal tubes, a statistically significant increase in mean PD values was observed at both 3 and 6 months for molar bands. In a previous study conducted with fifteen subjects, several periodontal statuses (plaque index, BOP, and PD) were recorded and plaque samples from test and control sites at 7, 12, 47, 71, and 90 days after the start of orthodontic treatment were collected¹⁵. The authors verified a statistically significant increase in the plaque index and BOP and a small increase in the PD in the test sites over a period of three months. A longitudinal study that compared the periodontal status of banded and bonded teeth revealed that banded molars showed significant changes in periodontal status compared with the bonded molar¹¹. Although the specific measures of changes in periodontal status differed from the present study, these results were supported by the findings of our study. Similar long-term conclusions have also been made by other studies¹⁸.

V LIMITATIONS OF THE STUDY

1. Only a limited number of patients were included in this study.
2. Randomization was not performed.
3. Only one type of luting cement & adhesive was used.
4. Did not examine subgingival plaque.
5. Sophisticated mechanisms were not employed such as electron microscopy.
6. Multivariate analysis was not performed.

VI CONCLUSION AND RECOMMENDATIONS

Based on the methodology applied in this study, and according to the results obtained and applied to the statistical analysis, it was considered reasonable to conclude that: Bondable buccal tubes were better than molar bands regarding the periodontal status of orthodontic patients. More number of patients should be included in further study. Randomization should be performed in further study. Different types of luting cement & adhesive should be used in further study. Sophisticated mechanisms such as electron microscopy should be employed. Multivariate analysis should be performed in further study.

REFERENCES

- [1]. Buonocore MG. A Simple Method Of Increasing The Adhesion Of Acrylic Filling Materials To Enamel Surfaces. *J Dent Res.* 1955;34: 849–853.
- [2]. Zachrisson BU. A Post-Treatment Evaluation Of Direct Bonding In Orthodontics. *Am J Orthod.* 1977; 71:173–189
- [3]. Mizrahi E. Orthodontic Bands And Directly Bonded Brackets: A Review Of Clinical Failure Rates. *J Dent.* 1983; 11:231–236.
- [4]. Millett DT, Gordon PH. A 5-Year Clinical Review Of Bond Failure With A Non-Mix Adhesive (Right-On). *Eur J Orthod.* 1994; 16:203– 211.
- [5]. Sallum E J Et Al. 2004 Clinical And Microbiologic Changes After Removal Of Orthodontic Appliances. *American Journal Of Orthodontics And Dentofacial Orthopedics* 126: 363 – 366
- [6]. Gong Y, Lu J, Ding X. Clinical, Microbiologic And Immunologic Factors Of Orthodontic Treatment-Induced Gingival Enlargement. *Am J Orthod Dentofacial Orthop.* 2011;140(1):58-64
- [7]. Baer, P.N., Cocarro, J., 1964. Gingival Enlargement Coincident With Orthodontic Therapy. *J. Periodontol.* 35, 436–439.
- [8]. Zachrisson, B.U., 1976. Cause And Prevention Of Injuries To Teeth And Supporting Structures During Orthodontic Treatment. *Am. J. Orthod. Dentofacial Orthop.* 69, 285–300.
- [9]. Atack N E, Sandy J R, Addy M 1996 Periodontal And Microbiological Changes Associated With The Placement Of Orthodontic Appliances. A Review. *Journal Of Periodontology* 67: 78 – 85
- [10]. Saud A. Al-Anezi The Effect Of Orthodontic Bands Or Tubes Upon Periodontal Status Duringthe Initial Phase Oforthodontic Treatment. *The Saudi Dental Journal* (2015) 27, 120–124
- [11]. Boyd Y D, Baumrind S 1992 Periodontal Considerations In The Use Of Bonds Or Bands On Molars In Adolescents And Adults. *Angle Orthodontist* 62: 117 – 126
- [12]. Ngan, P., Wilson, S., Shanfeld, J., Amini, H., 1994. The Effect Of Ibuprofen On The Level Of Discomfort In Patients Undergoing Orthodontic Treatment. *Am. J. Orthod. Dentofacial Ortho.* 106, 88–95.
- [13]. Burden, D., Mullally, B., Sandler, J., 2001. Orthodontic Treatment Of Patients With Medical Disorders. *Eur. J. Orthod.* 23, 363–372.
- [14]. National Institute For Health And Clinical Excellence, 2013. Prophylaxis Against Infective Endocarditis.

- [15]. Huser M, Baehni P, Lang R 1990 Effects Of Orthodontic Bands On Microbiologic And Clinical Parameters. American Journal Of Orthodontics And Dentofacial Orthopedics 97: 213 – 218
- [16]. Diamanti-Kipiotti, A., Gusberti, F.A., Lang, N.P., 1987. Clinical And Microbiological Effects Of Fixed Orthodontic Appliances. J. Clin. Periodontol. 14, 326–333
- [17]. Kloehn, J.S., Pfeifer, J.S., 1974. The Effect Of Orthodontic Treatment On The Periodontium. Angle Orthod. 44, 127–134
- [18]. Polson A M Et Al. 1988 Long-Term Periodontal Status After Orthodontic Treatment. American Journal Of Orthodontics And Dentofacial Orthopedics 93: 51 – 58