

Original Research Article

The periodontal effect of bleeding on probing and probing depth for molar bands and bondable buccal tubes

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ABSTRACT

Background: With rising life expectancy and esthetic awareness, more patients seek orthodontic treatment. This study shows molar bands cause more plaque retention, leading to higher bleeding on probing (BOP) and probing depth (PD) compared to bondable buccal tubes.

Methods: This non-randomized control clinical trial was conducted at the department of orthodontics, Bangabandhu Sheikh Mujib medical university hospital (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 consecutively from patients selected for fixed orthodontic treatment in BSMMU.

Results: The patients were aged 13-22 years [Mean (\pm SD) age=16.0 \pm 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). The presence of BOP in molar bands at T₁, T₂ and T₃ was 0 (0.0%), 2 (10%) and 4 (20%). The presence of BOP in bondable buccal tubes at T₁, T₂ and T₃ was 0 (0.0%). 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 ($p=0.030$).

Conclusions: This study analyzed data over three and six months, finding that molar bands led to greater increases in BOP and PD than bondable buccal tubes, but long-term periodontal effects remain unclear.

Keywords: Periodontal effect, Molar bands, Probing depth, Bleeding on probing, Bondable buccal tubes

INTRODUCTION

The increase of life expectancy and purchasing power along with the changes in esthetic concepts increased the number of patients seeking orthodontic treatment combining functional benefits to smile esthetics.¹ Plaque retention surrounding orthodontic appliance e.g. molar bands or bondable buccal tubes leads to periodontal disease. Therefore, the employment of appliance that facilitates the periodontal status of the patients is important

in fixed orthodontic treatment. The placement of orthodontic appliance in subjects undergoing orthodontic treatment might provoke adverse changes in gingival microflora with the development of gingivitis and consequently periodontitis.² Orthodontic molar bands may play a role in contemporary orthodontics when rapid maxillary expansion (RME) is used. RME is an orthopedic procedure that utilizes heavy forces to correct transverse maxillary arch discrepancies. Nevertheless, bondable buccal tubes display clear advantages over the use of molar

bands and do not involve any additional appointments for separation and pain associated with separation.³ Furthermore, bondable buccal tubes may benefit several medical conditions in which maintaining a good standard of oral hygiene is important during treatment.⁴ The difference between a molar band and bondable buccal tubes regarding plaque accumulation, gingival inflammation, and loss of attachment.⁵ There are some added advantages of using bondable buccal tubes instead of molar bands. Firstly, maintaining a large stock of various sized bands becomes unnecessary; secondly, a separation appointment is not needed, and thirdly, the extensive pain accompanied by the separation visit does not occur.³ And so, all possible efforts should be made to prevent, and if prevention is not possible, reduce these potential treatment effects of bands, especially in medically compromised individuals.^{4,6} Clinical assessment of periodontal status including the presence or absence of BOP and PD measurements using periodontal probe was taken at the start of treatment (T_1), three months (T_2), and six months (T_3) into treatment. 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. Molar bands were associated with an increase in mean PD values in both 3 and 6 months follow up were no significant change for bondable buccal tubes. Therefore, this present study has demonstrated that molar bands are associated with a greater increase in BOP and PD than bondable buccal tubes; however, the long-term effects of both molar bands and bondable buccal tubes have not yet been evaluated. This study will help orthodontists to choose the right attachment to molar teeth during orthodontic treatment. As far as I know, no previous research regarding this topic was performed in this country.

METHODS

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. Sample technique was consecutive sampling. At first 10 orthodontic patients were selected from patients who were selected for fixed orthodontic treatment in BSMMU and 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 Figure 1. Instruments used for attachment of the bondable buccal tube have been shown in Figure 2. Figure 3 show the intre-treatment photograph of the right laterat 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). Twenty 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 and then light-cured. P value was considered significant at $p \leq 0.05$ with a confidence interval of 95% and 80% power. 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. The 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. The inclusion criteria for this study required participants to have a full adult dentition, no pre-existing periodontal disease, and a similar oral hygiene status. Additionally, participants needed to be available for data collection during first six months of orthodontic treatment. The exclusion criteria included patients requiring arch expansion or an auxiliary appliance, those with systemic diseases, and individuals currently taking antibiotics.



Figure 1: Materials and instruments for attachment of molar band.



Figure 2: Materials and instruments for attachment of bondable buccal tubes.

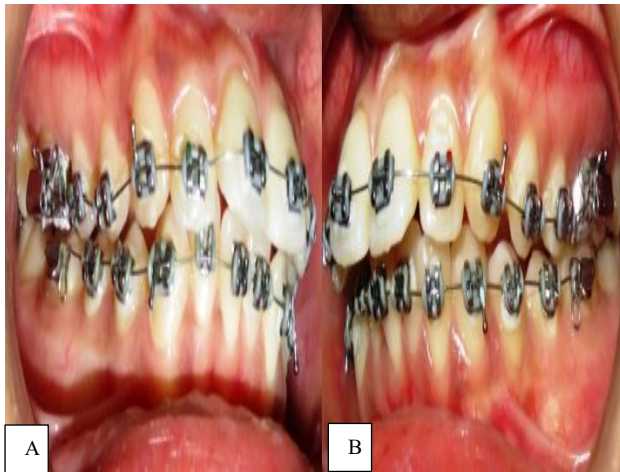


Figure 3 (A and B): Intra-treatment photograph (Right and left lateral).

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 1). The absence of BOP in molar bands at T₁, T₂ and T₃ was 20 (100%), 18 (90%) and 16 (80.0%). The presence of BOP in molar bands at T₁, T₂ and T₃ was 0 (0.0%), 2 (10%) and 4 (20%). The absence of BOP in bondable buccal tubes at T₁, T₂ and T₃ was 20 (100%). The presence of BOP in bondable buccal tubes at T₁, T₂ and T₃ was 0 (0.0%) (Figure 4). There was statistically no significant difference in the BOP between molar bands and bondable buccal tubes at T₁ and T₂ (p=0.147) but at T₃ BOP significantly (p=0.035) increase in the case of molar bands (Table 2). 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 3). 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 4).

Table 1: Group identities, arch and molar attachments were used for each group.

| Group | Arch | Molar attachments | Number of samples |
|-------|-------|-----------------------|-------------------|
| A | Upper | Molar bands | 20 |
| B | Lower | Bondable buccal tubes | 20 |

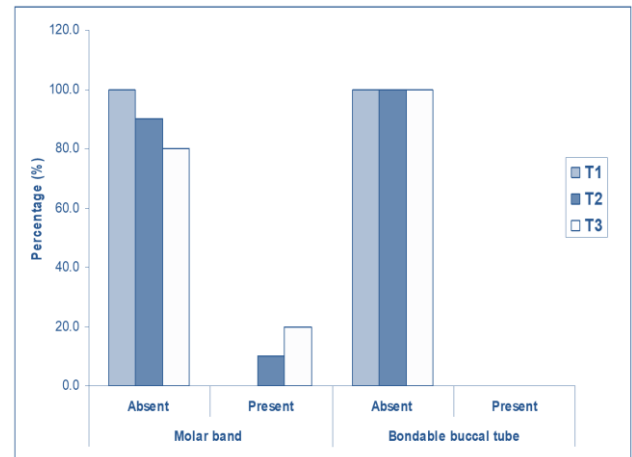


Figure 4: Absence and presence of BOP in percentage for molar bands and bondable buccal tubes at T₁, T₂ and T₃.

Table 2: Association of BOP between molar bands and bondable buccal tubes at different follow up, (n=40).

| Follow up | Absence/presence of BOP | Molar bands, (n=20) (%) | Bondable buccal tubes, (n=20) (%) | P value |
|----------------|-------------------------|-------------------------|-----------------------------------|---------|
| T ₁ | Absent | 20 (100) | 20 (100) | - |
| | Present | 0 (0.0) | 0 (0) | |
| T ₂ | Absent | 18 (90) | 20 (100) | 0.147 |
| | Present | 2 (10) | 0 (0) | |
| T ₃ | Absent | 16 (80) | 20 (100) | 0.035 |
| | Present | 4 (20) | 0 (0) | |

Table 3: 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 T ₁ versus BOP T ₂ | 0.146 | - |
| BOP T ₂ versus BOP T ₃ | 0.375 | - |
| BOP T ₁ versus BOP T ₃ | 0.034 | - |

Table 4: 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 T ₁ versus PD T ₂ | <0.001 | 0.163 |
| PD T ₂ versus PD T ₃ | <0.001 | 0.330 |
| PD T ₁ versus PD T ₃ | 0.030 | 0.083 |

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 revealed that molar bands caused bleeding when probing the buccal surfaces of the molars compared with bondable buccal tubes.^{2,5,7} In comparing molar bands to bondable buccal tubes, no statistically significant difference was observed at the first 3 months but a significant increase in BOP at 6 months was observed in case of molar bands. Moreover, these molar bands mediated effects caused might be the result of the chemical irritation caused by the cement material, the greater likelihood of food impaction on the back teeth, and the tendency to brush more efficiently among the front teeth rather than the back teeth. 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 BOP than bondable buccal tubes. This might be explained by factors such as the involuntary irritation caused by bands, which are likely to be in contact with the gingival margin.⁸ The changes in PD were also different between molar bands and bondable buccal tubes. In this current study, molar bands were associated with an increase in mean PD values in both 3- and 6-months follow-up where no significant change for bondable buccal tubes. 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. Unlike in several studies, the present study did not include examining subgingival plaque, and sophisticated types of machinery such as electron microscopy were not employed.^{9,10}

Orthodontic molar bands may play a role in contemporary orthodontics when headgear or RME is used. Nevertheless, bondable buccal tubes display clear advantages over the use of molar bands and do not involve any additional appointments for separation and pain associated with separation.³ Furthermore, bondable buccal tubes may benefit several medical conditions in which maintaining a good standard of oral hygiene is important during treatment.⁴

Limitations

Only a limited number of patients were included in this study. Randomization was not performed. Only one type of luting cement and adhesive was used. Did not examine sub gingival plaque. Sophisticated mechanisms were not employed such as electron microscopy and multivariate analysis was not performed.

CONCLUSION

Molar bands were associated with more BOP compared with bondable buccal tubes during orthodontic treatment. Also, molar bands were associated with more increase in PD compared with bondable buccal tubes during orthodontic treatment. Bondable buccal tubes should be incorporated in routine orthodontic practices. More number of patients should be included in further study. Randomization should be performed in further study. Sub gingival plaque should be examined. Multivariate analysis should be performed in further study. The long term effects should be analyzed.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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