

COMPARISON BETWEEN MOLAR BANDS, BONDABLE TUBES AND BONDABLE TUBES WITH FLOWABLE COMPOSITE

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Abstract

Orthodontic treatment is an expensive treatment in dentistry and the treatment period is between two to three years. The cost and treatment time could be significantly increase if metal attachment (brackets, molar tubes and bands) is lost/ broken. The failure of bondable tube and molar band could increase the cost for orthodontic treatment. With additional flowable composite to bondable tube, the failure rate could become lower. The objective of this study is to compare the failure rate between molar bands, bondable tubes and bondable tubes with flowable composite. In this study, 30 patients attending orthodontic specialist clinic in USIM were randomly selected and grouped into Group A, B and C. Group A were cemented with molar bands, Group B with bondable tubes and Group C with bondable tubes with flowable composite. Upper and lower fixed appliances were also bonded. The failure rate (molar bands or tubes become loosed/ need recemented/ rebonded) of each group will be assessed after 1 month, 3 months and 6 months.

Keywords: *flowable composite, bondable tubes, molar bands*

1. Introduction

One of the greatest impacts on orthodontic treatment (braces) is the development of adhesives for bracket bonding. Orthodontic bonding has become as part of routine clinical procedure in orthodontic treatment for fixed appliances since 1980s. This procedure has reduced the need for bands (Trimpeneers *et al.*, 1996). Although many practitioners still band the molar teeth, there are some who choose to bond metal tube to molars. This procedure has

eradicated the need to open and close the space for band insertion. The comfort, speed and facility of placing the appliances as well as better aesthetics in comparison to banding are reasons for the success with this technique(Reynolds, 1975). A current technique for bracket attachment and bonding is by using light-cure resin composite(Wendl *et al.*, 2008). The advantages of light cure composites are accurate bracket position, longer working time, easy removal of excess adhesive and higher bond strength in comparison to chemical cure composites(Greenlaw R 1989 ; Galindo *et al.*, 1998; Wendl *et al.*, 2008).

Edward H Angle introduced the use of bands with brackets in 1928. The solid metal brackets were welded to the band and had to be customized for each patient. The time needed to fit and cement the band to teeth was considerably long. The introduction of adhesive resins in orthodontics has permitted the practitioner to bond directly bracket onto tooth surface. Meaning that adhesive are most widely used for bonding between brackets and enamel(Shinya *et al.*, 2008; Zachrisson, 1977; Mirza, 1983; Kinch *et al.*, 1988). One of the advantages of adhesive bonding is that the procedure has reduced treatment time in clinical procedure (Jenkins, 2005).

In addition, it is more convenient to the practitioner and comfortable for patient. Bryant *et al* in their study noted that bonding had abolished the need for pre-treatment separation, reduced interdental spaces created from bands, decreased decalcification risk and increased the ability for the detection of caries(Bryant *et al.*, 1987). Jenkins also suggested that bonding had eliminated band seating problems, improved aesthetic appearance, reduced the need for separation, improved oral hygiene, allowed easy access to interproximal area and eradicated the need for space closure at the end of treatment(Jenkins, 2005). In contrast to bonding, banding needed space separations to release the tight contact point between teeth. It is impossible to place a band on a tight contact point. Moreover, the interdental space created from the use of banding on each tooth was also reduced. Decalcification risk decreased because less tooth surface was covered and becomes easier to notice any caries that have occurred.

Another concern of the bonding procedure is related to the adhesive strength, adhesive application and residual adhesive resin on tooth surface at the end of treatment (Sinha *et al.*, 1995).One of the reasons for the use of metal band in posterior teeth is because bonding has inferior physical properties (Jenkins, 2005). The lack of strength in adhesive will lead to bond failure. Powers *et al* also agree that bond failure could result in additional cost in material, longer treatment time and increase the number of visit for treatment(Powers *et al.*, 1997).

Sharma-Sayal et al noted that various designs of bracket bases have been made to improve the mechanical retention between bracket and adhesive (Sharma-Sayal *et al.*, 2003).

The aims of this study therefore were to assess the failure rate between molar bands, molar tubes and molar tubes with flowable composite. Thus, the best way to apply attachment to molar teeth can be made. In the end this will reduce failure rate of molar attachment.

2. Materials and methods

A total number of 30 patients were randomly selected for this study. They were divided into 3 groups. Group A patients were cemented with molar bands, Group B with bondable tubes and Group C with bondable tubes and flowable composite.

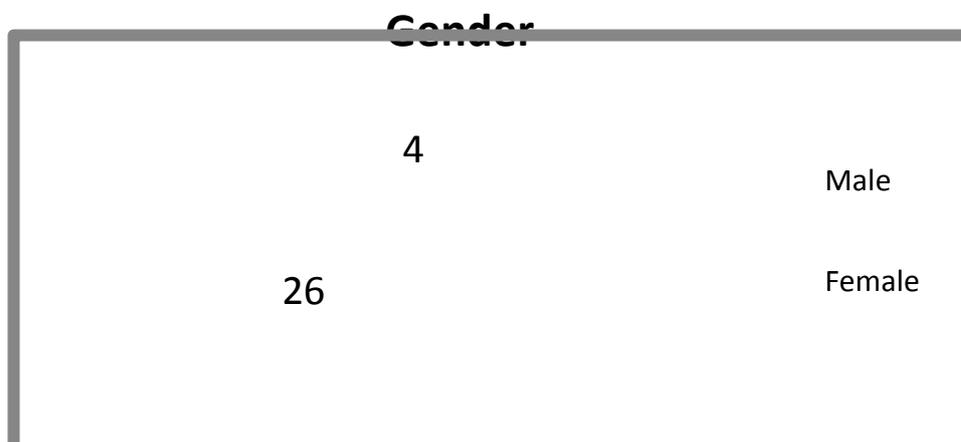
The failure rate is defined as any molar bands or tubes which are loosen, detached or broken. The data collections were done in 1, 3 and 6 months after bond up. The failure rates were compared between each groups and each period. The data collected were then being analyst using SPSS.

3. Results

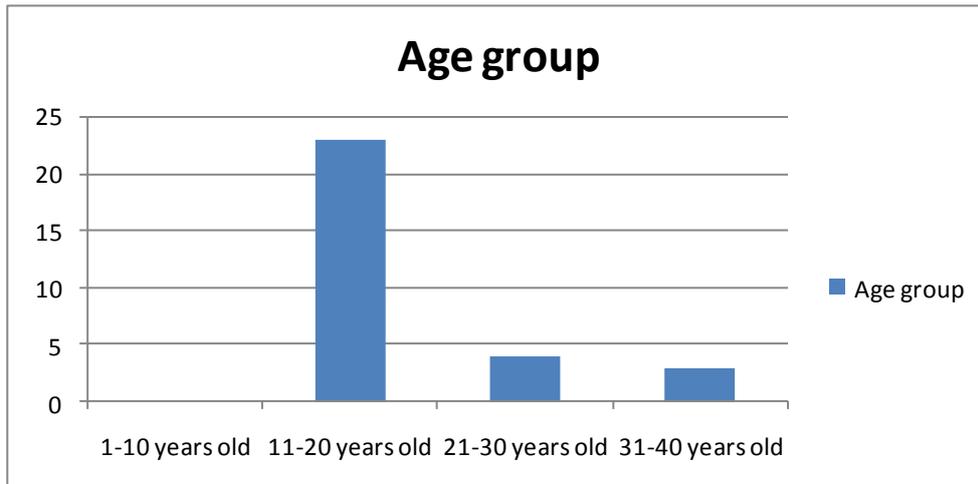
From the sample size, from 30 patients involved in this study, 26 patients are female and only 4 are male. This could be because female are more concern of their appearance and willing to seek for treatment.

The age groups are mainly between 11 to 20 years old patient which consist of 23 patients. Apart from that, there are 4 patients from 21-30 years old and 3 patients from 31-40 years old group. This is because most patients are still studying and could not afford treatment in private clinic.

Chart 1: Gender distribution



Graph 1: Age group distribution



A month after bond up, one patient experienced molar bond failure in Group B which is bondable tube group. The other two groups which are the Group A patients cemented with band and Group C patients bonded with bondable tube plus flowable composite did not experienced any band or bond failure.

After three months post bond up, the result is still the same as a month after bond up. One patient still experienced bond failure in Group B. The band and bondable tube with flowable composite still did not experience any band or bond failure. Six month post bond up shows the number of bondable tube failure increased to two patients in Group B, one patient experience bond failure in Group C and no band failure in Group A.

However, a One Way ANOVA analysis shows that the differences between groups are not statistically significant of $p > 0.05$ for all periods. This could be because of the small sample size.

Table 1: One month post debond

| <i>Group A (band)</i> | <i>Group B (bondable tube)</i> | <i>Group C (bondable tube with flowable)</i> |
|---------------------------|------------------------------------|--|
| <i>30/30</i> | <i>29/30</i> | <i>30/30</i> |

The number of patient after 1 month bond up without molar attachment failure.

| <i>Group A (band)</i> | <i>Group B (bondable tube)</i> | <i>Group C (bondable tube with flowable)</i> |
|---------------------------|------------------------------------|--|
| <i>0%</i> | <i>3.3%</i> | <i>0%</i> |

Failure rate of each group comprise of 30 patients.

Table 2: Three months post debond

| <i>Group A (band)</i> | <i>Group B (bondable tube)</i> | <i>Group C (bondable tube with flowable)</i> |
|---------------------------|------------------------------------|--|
| 30/30 | 29/30 | 30/30 |

The number of patient after 3 month bond up without molar attachment failure.

| <i>Group A (band)</i> | <i>Group B (bondable tube)</i> | <i>Group C (bondable tube with flowable)</i> |
|---------------------------|------------------------------------|--|
| 0% | 3.3% | 0% |

Failure rate of each group comprise of 30 patients.

Table 3: Six months post debond

| <i>Group A (band)</i> | <i>Group B (bondable tube)</i> | <i>Group C (bondable tube with flowable)</i> |
|---------------------------|------------------------------------|--|
| 30/30 | 28/30 | 29/30 |

The number of patient after 1 month bond up without molar attachment failure.

| <i>Group A (band)</i> | <i>Group B (bondable tube)</i> | <i>Group C (bondable tube with flowable)</i> |
|---------------------------|------------------------------------|--|
| 0% | 6.6% | 3.3% |

Failure rate of each group comprise of 30 patients.

4.0 Statistical Analysis

Statistical analysis was done using One Way ANOVA to compare the relationship between the three groups with $p > 0.05$. The data summaries are as followed:

Table 4: One month after bond up

| | <i>Sample</i> | | | <i>Total</i> |
|------------------|----------------|----------------|----------------|--------------|
| | <i>Group A</i> | <i>Group B</i> | <i>Group C</i> | |
| <i>N</i> | 10 | 10 | 10 | 30 |
| $\sum X$ | 40 | 39 | 40 | 119 |
| <i>Mean</i> | 4 | 3.9 | 4 | 3.9667 |
| $\sum X^2$ | 160 | 153 | 160 | 473 |
| <i>Variance</i> | 0 | 0.1 | 0 | 0.0333 |
| <i>Std. Dev</i> | 0 | 0.3162 | 0 | 0.1826 |
| <i>Std. Err.</i> | 0 | 0.1 | 0 | 0.0333 |

Standard weighted-means analysis

ANOVA Summary Independent Samples k=3

| <i>Source</i> | <i>SS</i> | <i>df</i> | <i>MS</i> | <i>F</i> | <i>p</i> |
|--------------------------------|-----------|-----------|-----------|----------|----------|
| <i>Treatment between group</i> | 0.0667 | 2 | 0.0333 | 1 | 0.381099 |
| <i>Error</i> | 0.9 | 27 | 0.0333 | | |
| <i>Total</i> | 0.9667 | 29 | | | |

$p > 0.05$

Table 5: Three months after bond up

| | Sample | | | Total |
|------------|---------|---------|---------|--------|
| | Group A | Group B | Group C | |
| <i>N</i> | 10 | 10 | 10 | 30 |
| $\sum X$ | 40 | 39 | 40 | 119 |
| Mean | 4 | 3.9 | 4 | 3.9667 |
| $\sum X^2$ | 160 | 153 | 160 | 473 |
| Variance | 0 | 0.1 | 0 | 0.0333 |
| Std. Dev | 0 | 0.3162 | 0 | 0.1826 |
| Std. Err. | 0 | 0.1 | 0 | 0.0333 |

*Standard weighted-means analysis**ANOVA Summary Independent Samples k=3*

| Source | SS | df | MS | F | p |
|-------------------------|--------|----|--------|---|----------|
| Treatment between group | 0.0667 | 2 | 0.0333 | 1 | 0.381099 |
| Error | 0.9 | 27 | 0.0333 | | |
| Total | 0.9667 | 29 | | | |

p > 0.05

Table 6: Six months after bond up

| | Sample | | | Total |
|------------|---------|---------|---------|--------|
| | Group A | Group B | Group C | |
| <i>N</i> | 10 | 10 | 10 | 30 |
| $\sum X$ | 40 | 38 | 39 | 117 |
| Mean | 4 | 3.8 | 3.9 | 3.9 |
| $\sum X^2$ | 160 | 148 | 153 | 461 |
| Variance | 0 | 0.4 | 0.1 | 0.1621 |
| Std. Dev | 0 | 0.6325 | 0.3162 | 0.4026 |
| Std. Err. | 0 | 0.2 | 0.1 | 0.0735 |

*Standard weighted-means analysis**ANOVA Summary Independent Samples k=3*

| Source | SS | df | MS | F | p |
|-------------------------|-----|----|--------|-----|----------|
| Treatment between group | 0.2 | 2 | 0.1 | 0.6 | 0.555966 |
| Error | 4.5 | 27 | 0.1667 | | |
| Total | 4.7 | 29 | | | |

p>0.05

4. Discussion

One of major problem in orthodontic fixed appliances is debond of molar tubes. It could not only cost money but precious time as well. Five to ten minutes of clinical time is requires for rebond and could prolong the waiting time of other patients. Apart from that, to replace and bond molar tube requires good moisture control and lot of concentration. The

conventional method of placing band requires two day visits, skills and a wide inventory of band sizes.

Placing additional flowable composite around molar tubes in this study has proven that it could reduce molar tube failure and could be as good as band. Although statistically it is not statistically significant, but clinically it shows that bondable tube with flowable composite have lower failure rate compared to bondable tube alone. However, the case selection is very important because patient must have very good oral hygiene and should be monitor closely to prevent any white sport lesion due to the additional composite around molar tubes.

5. Conclusion

From this study, we could conclude that the failure rate is higher between bondable tubes compare to molar bands and bondable tubes with flowable composite. Application of flowable composite to bondable tubes could increase the bondable tubes strength and thus reduce the failure rate of bondable tubes. However, a study of 18 months post bond up will be done to assess the long term failure rate of each group.

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