Original article

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Clinical Survival of Rebonded Brackets with Different ARI Scores

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Abstract

Introduction: Bracket debonding is one of the most common events in orthodontics. The aim of the present study was to quantitatively compare clinical survival of rebonded brackets with different ARI scores with new brackets rebonding. Materials and Methods: The subjects in the present study consisted of 74 patients with 76 debonded brackets on maxillary first and second premolars. After refreshing the bracket base of the debonded brackets, they were assigned in two groups: group A with 27 brackets of ARI≥4 and group B with 28 brackets of ARI≤2. In 21 cases, new brackets were used (group C). The frequency of the debonding in each rebonded group during treatment was calculated in intervals of 6,12,18 mounths after onset of bracket rebonding . Chi-squared test was used to compare the frequency of debonded brackets. Results: The frequency of debonded brackets was significantly higher in group B (ARI≤2) than those of groups A (ARI≥4) and C (new brackets). The number of debonded brackets were not significantly different between groups A (ARI≥4) and C (new brackets). Conclusion: Rebonding strength of debonded brackets in those that the failure is presented between adhesive and enamel (ARI≥4) could be clinically acceptable with no need to use new brackets.

Key words: dental bonding; orthodontic brackets; prevalence

Introduction

Accidental debonding of brackets due to trauma of chewing is a common occurrence. Moreover, intentional removal and reposition of brackets is a part of routine orthodontic procedure to achieve ideal tooth alignment and occlusion (1). From an epidemiological viewpoint, the prevalence rate of bracket debonding has been reported to be 3.5–22 percent (2).

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Before rebonding, there are two options; use of a new bracket or, making changes in the previous bracket in order to use it again (3). There is no consensus in previous studies in relation to the comparison of rebonded brackets and brackets bonded for the first time (4-6). Different techniques have been recommended for reconditioning of brackets in order to rebond them, including sandblasting (7),use of different lasers (8), microetching (4), and industrial recycling of the bracket base (9). Use of the techniques mentioned above for rebonding of brackets has not become widespread due to their economical charges or difficulties or their time-consuming nature.

Almost many studies on the bonding strengths, considering ARI index, have the kind of debonding failure that could be between adhesive and enamel surface or between adhesive and bracket base or inter-adhesive (6-9). But no survey was carried out so far to evaluate the effect of ARI on rebonding strength. The present study aimed to compare the frequency of deboned brackets with different ARI scores after they were rebonded. In this regard also a new technique was introduced that compared to other previous rebonding methods, is more easy and cost-effective with short chair time that could results in sufficient clinical durability after rebonding.

Materials and Methods

In the present analytical retrospective study, the census sampling technique was used and all the patients of a author's, orthodontic clinics during 2 years treatment period (from 2012 to 2014) were analyzed. All patients were under treatment using standard edgewise system 18 slot with twine brackets with notched bases (Equilibrium, Dentaurum Inc, Germany). Of a total of 281 debonded brackets recorded, 95 cases involved maxillary first and second premolars. Those with experience of trauma or unusual occlusal contact or unusual hard feeding (reported by the patients or his/her parents), those with oral habits such as bruxism or clenching and those with frequent debonding of the same bracket were excluded from the study. Finally a total of 76 samples were included in the study, the samples were assigned in 3 groups. Group A and B included the brackets that were debonded during the treatment. The bases of these brackets were screened and calculated directly by the clinician observation (author of the study).A glass magnifier was used to determine the percentage of the adhesive remnant relative to the base of the bracket. Magnifier divided into 10 equal sections then was base of the bracket was observed at a distance that the bracket base was looked as the same size as the magnifier, by calculating the sections ARI was registered. Finally, group A consisted of 27 brackets with completely covered or more than 90% adhesive in the base (ARI≥4) and group B consisted of 28 brackets with no or less than 10% adhesive on the base (ARI≤2). In 21 cases, new brackets were used (group C).

Rebonding was carried out by one operator and identical bonding conditions were performed for all subjects considering the technique and materials.

Definition of grading of ARI:

ARI score was categorized by the following nomenclature per the reference study10:

Score 5: no adhesive is remaining on enamel, i.e, all adhesive is on bracket surface

Score 4: <10% adhesive is remaining on enamel, i.e, >90%adhesive is on bracket base

Score 3: 10-90%adhesive is remaining on enamel

Score 2: >90%adhesive is remaining on enamel, (i.e., <10% adhesive remains on bracket)

Score1: all the adhesive is remaining on enamel

Figure 1: Group A

Figure 2: Group B

Rebonding Technique:

In groups A (figure 1) and B (figure 2), the remaining composite resin of bracket were removed in a very thin layer at refreshing level using a multi-blade carbide bur (D&Z, Lemgo, Germany) with a speed of 30,000 rpm in a manner not to expose the metallic mesh of the bracket. In the control group (group C, new brackets) the brackets did not need any refreshing. After removal of the remaining adhesive on the tooth with the use of a tungsten carbide bur, the enamel was etched for 15 seconds with the use of 35% phosphoric acid (Ultradent Products Inc, SouthJordan, USA), followed by rinsing for 20 seconds and drying. The bonding agents consisted of No Mix adhesive resin (Resilience, Orthotechnology, Tampa, USA) as per instruction of the company.

The number of debonded brackets after rebonding were calculated in groups A, B and C for three intervals of after 6, after 12 and after 18 months post bracket rebonding. Cases in which debonding was due to accidental trauma were not considered in the calculation.

The frequency of the debonding in each rebonded group of these intervals was calculated. Chi-squared test with SPSS 17 was used to compare the number of debonded brackets in groups for each interval. Statistical significance was set at $P<0.05$.

Results

Comparison of the debonded brackets showed frequency rates of 22.2%, 19% and 67.9% in groups A(ARI≥4), C (new brackets) and B (ARI≤2), respectively (Table 1). Comparison of the frequency of the debonding in each rebonded group during treatment in intervals of 6, 12, and 18 months after onset of bracket rebonding are shown in table 2.

Chi-squared test showed no significant differences in the frequencies of deonded brackets between groups A and C (P=0.527). Chi-squared test showed a significantly higher frequency of debonded brackets in group B (ARI≤2) compared to group C (P=0.002). Chi-squared test showed a significantly higher frequency of debonded brackets in group B (ARI≤2) compared to group A (P=0.009).

Discussion

Comparison of new and rebonded /recycled brackets has been a subject of great interest in orthodontic research (10-13). The aim of recycling debonded brackets is to reduce the cost of placing new brackets.

Several techniques have been used for recycling of orthodontics brackets i.e removal of resin remnant and reuse of the debonded brackets. These methods include air abrasion (7), silicon carbide grinding (7), direct flame (11), microetching (1,4), lasers (8,11), and industrial recycling (7). Every successful recycling technique should not only yield a reliable bond strength (3-9, 11, 12), but also

require a minimum level of armamentarium, be easy to use, consume minimum chair time and dose not damage the bracket. Large scale use of the previously described methods for recycling brackets has been limited because of reasons like high cost or consumption of great deal of time.

	Number of brackets	Debonded brackets		P value*
		%	No.	
ARI≥4	27	22.2	6	**0.527**
new	21	19	4	
ARI ≤2	28	67.9	19	**0.002**
new	21	19	4	
ARI≥4	27	22.2	6	**0.009**
ARI ≤2	28	67.9	19	

Table1: Comparison of the frequencies of debonded brackets between the three groups

	Number of debonded brackets	6 month	12 month	18 month
ARI≥4	6	_	5(83.3%)	1(16/7%)
ARI ≤2	19	11(57/9%)	8(42.1%)	_
new	4	_	3(75%)	1(25%)
	Chi-Square Tests		χ^2=11.56 , P=0.021	

Table2: Comparison of the frequencies of debonded brackets in 3 intervals between groups

A difference between the present study and previous studies was the technique used to prepare brackets for rebonding. Another advantage of the present study was the evaluation of the effect of ARI on the clinical service of rebonded brackets because in all the previous techniques all the remaining resin is removed before rebonding; however, in the present study the remaining resin on the bracket base was only slightly roughened. Another difference in the present study was the fact that the bond durability of rebonded brackets was primarily dependent on the chemical bond between composite resin and

composite resin; however, in previous studies the mechanical bond of composite resin to the base of the metallic bracket has been emphasized.

The results of the present study showed that durability and number of debonded brackets after rebonding in group A (ARI≥4) was similar to the new brackets; however, when group B (ARI≤2) was compared with the group with high ARI and new brackets, there were significant differences in rebonding failure. A drawback to our technique is that clinical side effect including possible changes to the effective in/out, torque and rotation preadjustments built into the brackets might rise .The magnitude of this changes which are due to additional resin layer would have to be evaluate with respect to the magnitude of the natural variation in the facial structures of the teeth (3). If deemed necessary, respective compensating bends can be made in the arch wire to fend off this side effects.

Conclusion

The technique introduced in the present study, contrary to all the previous studies, does not eliminate the remaining composite resin on the bracket mesh and does not prove its efficacy in gaining the maximum final mechanical retention, but it uses the advantage of the composite resin remaining on the bracket base, reminding the importance of the chemical bond between new composite resin and the old composite resin, which is a common occurrence in restorative procedures. Therefore, the debonded brackets with high ARI can be rebonded instead of bonding new brackets.

References

1. Mui B, Rossouw PE, Kulkarni GV: Optimization of a procedure for rebonding dislodged orthodontic brackets. Angle Orthod, 1999, 69: 276-81.
2. Lovius BB, Pender N, Hewage S, ODowling I, Tomkins A: A clinical trial of light activated bonding material over an 18 month period. Br J Orthod,1987,14: 11-20.
3. Egan ER, Alexander SA , Cartwright GE: Bond strength of rebonded orthodontic brackets. Am J Orthod Dentofac Orthop , 1996, 109:64-70.
4. Eminkahyagil N, Arman A, Cetinşahin A, Karabulut E: Effect of resin removal methods on enamel and shear bond strength of rebonded brackets. Angle Orthodontist, 2006, 76:314-21.
5. Jassem HA, Retief DH, Jamison HC: Tensile and shear strength of bonded and rebounded orthodontic attachments. Am J Orthod, 1981, 79:661-68.
6. Bishara SE, Vonwald l, Laffon JF, Warren J: Effect of repeated bonding on the shear strength of a composite resin orthodontic adhesive. Angle orthodontist, 2000, 70:435-41.
7. Tavares SW, Consani S, Nouer DF, Magnani M, Nouer P, Martins L: Shear bond strength of new and recycled brackets to enamel. Br Dent J, 2006, 17:44-48.
8. Ishida K, Endo T, Shinkai K, Katoh Y. Shear bond strength of rebonded brackets after removal of adhesives with Er, Cr:YsGG laser. Odontology, 2011, 99:129-34.
9. Tavares SW, Consani S, Nouer DF, Magnani MB, PereiraNeto JS, Romano FL: Evaluation in vitro of the shear bond strength of aluminum oxide recycled brackets .Braz J oral Sci, 2003, 7:378-81.
10. Oliver RG: The effect of different methods of bracket removal on the amount of Residual adhesive. Am J Orthod Dentofacial Orthop, 1988, 93:196-200.
11. Yassaei S, Aghili H, KhanPayeh E, Goldanimoghadam M: Comparison of shear bond strength of rebonded brackets with four methods of adhesive removal .Lasers Med Sci, 2013, 35: 56-61.
12. Bishara SE, Vonwald l, Laffon JF, Warren J: Effect of repeated bonding on the shear strength of a composite resin orthodontic adhesive. Angle orthodontist, 2000, 70:435-41.
13. Montasser MA, Drummond JL, Evans CA: Rebonding of orthodontic brackets. Angle Orthodontist, 2008,78:531-36.