



ORIGINAL ARTICLE

Evaluation of bracket failure rate in orthodontic patients bonded with and without primer



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Abstract *Introduction:* Primers are considered widely essential for bonding orthodontic brackets. However, their role in minimizing bracket failure rates has been frequently questioned.

Objective: To investigate the difference in the bracket failure rate in direct bonding with and without the use of orthodontic primer.

Setting and design: A prospective, single blinded clinical study at a private clinical practice in Ras Al Khaimah, United Arab Emirates.

Methods and material: 38 class I bimaxillary protrusion patients requiring all first premolar extraction treatment were assigned to primer and non primer group (19/group) and bonded in a standardized manner. They were followed up from strap up till the end of treatment and bracket failure rate during the entire treatment was recorded, assessed and compared.

Statistical analysis: Statistical significance between the two groups was checked using Fischer's exact test (P less than .05 was considered significant).

Result: Debonding in non primer group was more than in primer group but not statistically or clinically significant.

Conclusion: The bonding of brackets without using orthodontic primer is possible; however, further research is advocated.

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1. Introduction

Conventional orthodontic bonding is usually a tri-step procedure involving etching, priming and bonding.¹ Bonding

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without the use of primer has been a subject of much interest to the orthodontist. Primer is usually an unfilled resin whose primary function is to improve the effectiveness of the final bond. Secondly, they are also claimed to protect the enamel from the consequent demineralization by the acid-etching and to reduce marginal leakage.

However, the use of primer adds a step in the bonding procedure which entails increased chair time, risk of moisture contamination and an increased procedural cost.

To date, six *in vitro* and three *in vivo* orthodontic studies have been published investigating bonding with and without the use of an intermediary liquid resin (primer/unfilled resin).

The *in vitro* studies²⁻⁷ have shown to a variable extent the possibility of achieving satisfactory bonding without using primer in orthodontics.

While the importance of *in vitro* studies cannot be underrated, it is also essential to consider clinical studies. Whilst these cannot control all variables to the extent of the laboratory-based studies, they may better reflect a more realistic clinical situation.

Bazargani et al. (1991)⁸ compared the failure rate of bonded lingual retainers with and without the use of primer. The study found a higher failure rate in the no primer group (27%) compared to the group with primer (4%). This was statistically significant and deemed clinically significant by the authors, who recommended bonding lingual retainers with primer.

However, this may not truly apply to bonding of orthodontic brackets as low viscosity resin used for retainer bonding generally has a lower shear bond strength than “normal” composite used for orthodontic bonding which may have affected the failure rate. Also, the surface area used for bonding retainers is generally less than for bonding of brackets. Therefore, previous studies observing bracket failure rates are more appropriate when analysing bonding brackets without primer.

A retrospective controlled study was carried out by Tang et al. (2000)⁹ comparing a chemically cured adhesive with and without the use of primer on bracket failure rates. The first bracket failure incidence was retrieved from patient records (with only the first failure counted for each bracket). The overall bracket failure rate was similar in both groups (5.62% without primer and 6.22% with primer), and it was concluded that the fixed appliances bonded without primer worked equally well; and did not reveal any clinician or material factors which may influence bracket failure rates.

Banks and Richmond (1994)¹⁰ analysed the risk of enamel decalcification as a primary outcome with or without use of sealants. Bracket failure rate was measured as the secondary outcome and was found to be similar in both groups (4% when primer is used and 3% without primer).

The drawbacks of these studies were their lack of randomization in sample allocation; lack of appropriate statistical analysis of bracket failure rate; failure to consider cross over effects and unclear details about the duration of the study period.

In a routine bonding procedure the bracket with composite at its base is placed on the tooth surface and gently pressed. This pressure helps to closely adapt the bracket on to the tooth surface and remove any excess composite as flash. The logic that this pressure application can also cause the high viscosity resin to flow into the microporosities on the tooth surface had there been no primer, and still provide adequate retention to the brackets, forms the backbone of this study, which was designed, with an aim to investigate the difference in the bracket failure rate when bonded with and without the use of an orthodontic primer.

2. Materials and method

This was a prospective clinical study carried out with all the cases started and followed up by the same clinician. The inclusions were selected from the patients who reported to

the private clinical practice at the Al Reef Dental and Orthodontic Centre, Ras Al Khaimah, United Arab Emirates for orthodontic treatment from November 2011 to April 2014. An informed consent for orthodontic treatment was taken from all the patients/parents in case of minor.

2.1. Inclusion criteria

- (i) Age, sex, diet and dentition: 14–25 years mixed diet male and female patients with full complement of erupted permanent teeth present from first molar to first molar in both arches.
- (ii) Malocclusion: Non surgical class I bimaxillary dentoalveolar protrusion cases which required conventional orthodontic treatment only were included with overbite and overjet between 1 and 4 mm; crowding < 4 mm in either of the arches where treatment plan involved all four first premolars extraction.
- (iii) No deleterious habits; good oral hygiene.
- (iv) Absence of any buccal surface caries.
- (v) The enamel surface being judged to be relatively free of developmental and morphologic defects known to interfere with bond strength.

2.2. Exclusion criteria

All cases other than aforementioned were excluded.

2.3. Sampling procedure

Sample sized calculation was done using sample size calculator (considering the population to be large) (<http://www.surveymethods.com/sscalc.htm>).¹¹ The sample size needed was 385 inclusions per group, with the following being standardized – confidence interval of .05, confidence level 95% and the power of study being set at 80%.

Since every patient had 20 teeth bonded, it accounted for 19.25 individuals (385/20) which was rounded off to the nearest whole number 19 per group. Difference between the two groups would be considered significant if the *P* value obtained after statistical test would be less than .05.

The patients were blinded about their inclusion in the NP (Non Primer) or the P (Primer) group. This was done to avoid any additional care the patient in the study group may take to minimize bracket debonding by information acquisition through the general dentist/any other orthodontist or through internet. Since there was only one orthodontist treating the patients and following them up in he was not blinded to the group allocation of the subjects.

All subjects were alternatively assigned to primer and non primer group and were then followed up for the entire treatment duration, being, from the time of strap-up (first strap up November 2011) to the time of debonding (last debonding April 2014).

In case siblings were started for the treatment with a similar treatment plan an exception to the above was made, and they were included in the same group to maintain blinding of skipping one step during the procedure.

In case of dropouts, subjects were added to the trailing group and the study continued till a 19-subjects/group finishes

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