ORIGINAL ARTICLE

Frequency Of Bracket Bond Failure In Orthodontic Patients With Normal Over Bite And Deep Bite

Ahmad Hasan

ABSTRACT:

Objective: To find out the frequency of bracket bond failure in patients with normal overbite and deep bite. **Methodology:** Sample consisted of 100 patients undergoing fixed orthodontic treatment at Orthodontic Department of Rawal Institute of Health Sciences, Islamabad between July 2014 and June 2016. Patients were divided into 2 equal groups. 50 patients were with normal overbite (0-2mm) and 50 patients were with deep bite(>2mm). All patients were bonded with metal brackets and were kept under observation for 12 months for bracket bond failure. SPSS 21 was used for statistical analysis.P-value <0.05was considered statistically significant.

Results: 43 patients showed bracket bond failure. 76 % patients with deep bite, while 10 % patients with normal overbite showed bracket bond failure (p-value <0.05). Female patients showed more bracket bond failure (43.9 %) than male subjects (41.2 %). Bracket bond failure in maxillary arch was 69.8 %, whereas it was30.2 % in mandibular arch. Bracket breakage was seen in buccal segment in 53.5 % of cases, while incidence was 46.5%in labial segment.

Conclusion: Bracket bond failure was more common in patients with deep bite. Female patients showed greater incidence and most common location was buccal segment in maxillary arch. Most frequent tooth with bracket bond failure was second premolar.

Keywords: Bracket breakage, Bond failure, Deep bite

INTRODUCTION:

Three-dimensional control of teeth during orthodontic treatment plays an important role in achieving optimum treatment results. This control of tooth movement is possible with the help of fixed appliances which are directly bonded on tooth enamel. For timely finishing of an orthodontic case, it is important that bonded appliance should survive till the end of treatment. However, some bonded brackets show bond failure during different stages of orthodontic treatment.[1] The ideal bond strength should be enough to withstand the masticatory forces, and it has to be away from the given forces throughout the phase of fixed appliance treatment. It should be in the optimum range to facilitate easy removal of bracket at the time of debonding without enamel fracture.[2]

Usually bonding is done with the application of 37% phosphoric acid on tooth enamel for 15 seconds followed by application of unfilled composite resin and placement of bracket on tooth surface having filled composite resin at its base. Composite resin is cured with the help of either light-cure or chemical cure initiation.[2,3]

Success of bonding is dependent on bonding technique used, concentration of etchant gel and application time of etchant, bracket base structure and operator expertise. Patient's factors which also include eating habits play an important role in preventing bracket bond failure.[1,2,3,4]

Investigators have previously studied prevalence of bracket bond failure in relation to gender and site of bond failure.[1,2,3,4,5] Researchers have also studied bond strength of different bonding materials on brackets and type of bonding technique used which may be either direct or indirect.[6,7,8,9,10,11]

However, in our research we investigated the frequency of bracket bond failure in patients with deep bite and normal overbite, so that relationship of bracket debonding in normal overbite and deep bite can be established.

✉ **Dr. Ahmad Hasan**
Associate Professor and Head
Department of Orthodontics
Rawal Institute of Health Sciences
Shaheed Zulfiqar Ali Bhutto Medical University,
Islamabad,
Email: ahmad.rihs@gmail.com
Karachi
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METHODOLOGY:

This cross-sectional comparative study was conducted at the Orthodontic Department of Rawal Institute of Health Sciences, Islamabad between July 2014 and June 2016. The sample size (n) was calculated by the following formula[12]

$n = Z^2 P(1-P) / d^2$, where n= sample size, Z= Z statistic for a level of confidence (it was set at 95%) P= Prevalence from a previous study, and d= precision (d= 0.05).

In this research 100 patients undergoing fixed orthodontic treatment were included. Patients were divided into 2 groups; 50 patients were with normal overbite (overbite 0-2mm) and 50 patients were having deep bite (overbite > 2 mm).[13]

Patient's incisor relationship was recorded according to British standard classification of incisor relationship.[14] Patient's gender was noted and patients were also divided in teens and adults depending on age.

Patients with enamel defects like fluorosis, amelogenesis imperfecta and with skeletal or dental cross bites were not included in this study. Patients having crowns, bridges and fillings on buccal or labial surface of the teeth were also excluded from the study. It was also ensured that no occlusal interferences were present after

bonding.
Teeth from second premolar to second premolar were bonded in both maxillary and mandibular arches. Teeth to be bonded were etched with 37% phosphoric acid (Swisstec SL Etchant Gel manufactures by Coltene Whaledent) for 15 seconds followed by rinsing of acid with water for 30 seconds. After drying the tooth with air, a thin layer of unfilled composite resin (Bonding agent) was applied on tooth surface and was cured for ten seconds with the help of light emitting diaode (LED). On the mesh surface of metal bracket, bonding agent was applied followed by placement of filled composite resin. Bracket was placed on labial or buccal surface of a tooth and was cured for 20 seconds with the help of LED. Transbond XT light cure adhesive system manufactured by 3M Unitek (USA) was used for bonding all brackets in this study. Metal brackets used in this study were manufactured by Ortho Organizer (USA) with slot size of 0.022 X 0.028" and these were with MBT Bracket Prescription.
All the clinical work was done by a single operator. All the patients included in this study were bonded with similar etchant, light-cure orthodontic adhesive system, light emitting diode lamp and metal brackets from the same manufacturer. It was ensured that during whole clinical procedures recommended clinical guidelines were followed. Good isolation was also ensured during bonding procedure. After bonding initial aligning archwire of 0.012 Niti was ligated in the brackets with the help of elastomeric ligatures.
Bracket bonding date was noted and patients were examined for bracket bond failure at monthly follow-up visits for 12 months from the day of bonding in case of patients with normal overbite and in patients with deep bite, they were observed till correction of deep bite. Bracket debonding was noted during intra-oral examination with naked-eye and was confirmed with the help of dental mirrors and tweezers.
In case of bracket bond failure, site of bracket breakage was noted. A bracket bond failure in a patient was recorded once and subsequent bracket breakages in the same patient were not included in the study. SPSS 21 was used for statistical analysis. Chi-Square test was used to find relationship of bracket debonding in both groups of deep bite and normal overbite.A p value of <0.05 was considered as significant.

RESULTS:
Our sample consisted of 100 patients (50 patients with normal overbite and 50 patients with deep bite). 34 patients were male and 66 patients were female. Table-1 showed the debonding status in patients with normal overbite and deep bite. Out of 100 patients, bracket bond failure was noted in 43 patients. 76 % (38 patients) showed debonding in patients with deep bite, while 10 % (5 patients) showed debonding in patients with normal over bite.There was statistically significant difference between bracket bond failure in the two groups of deep bite and normal overbite as p-value was < 0.05.
Table-2 showed debonding status according to gender. Female patients showed more bracket bond failure (43.9 %) than male subjects (41.2 %). Difference of bracket bond failure between male and female subjects was statistically insignificant as p-value is 0.791. Table-3 showed frequency of debonding noted in the two arches. Maxillary arch showed more bracket bond failure (69.8 %) as compared to mandibular arch (30.2 %).
Table-4 showed frequency of debonding noted according to site. Buccal segment showed more bracket bond failure (53.5%) as compared to labial segment which showed bracket bond failure in 46.5% of the total patients.

Table: 1
Cross Tabulation of Debonding Status in Normal Overbite and Deepbite

			Overbite		Total
			Normal Overbite	Deep Bite	
Debonding Status	No Debonding Noted	Count	45	12	57
		%	90.0%	24.0%	57.0%
	Debonding Noted	Count	5	38	43
		%	10.0%	76.0%	43.0%
Total		Count	50	50	100
		%	100.0%	100.0%	100.0%

Table: 2
Cross Tabulation of Bracket Bond Failure According to Gender

			Debonding Status	
			No Debonding Noted	Debonding Noted
Gender	Male	Count	20	14
		% within Gender	58.8%	41.2%
	Female	Count	37	29
		% within Gender	56.1%	43.9%
Total		Count	57	43
		% within Gender	57.0%	43.0%

Table: 3

Frequency of Bracket Bond Failure Noted in Maxillary and Mandibular Arches

			Debonding Noted
Arch	Maxillary Arch	Count	30
		%	69.8%
	Mandibular Arch	Count	13
		%	30.%
Total		Count	43
		%	100.0%

Table: 4

Frequency of Bracket Bond Failure Noted in Buccal and Labial Segments

			Debonding Noted
Site	Buccal Segment	Count	23
		%	53.5
	Labial Segment	Count	20
		%	46.5%
Total		Count	43
		%	100.0%

DISCUSSION:

In this study only frequency of debonding in patients with normal overbite and deep bite was studied. Patients with deep bite showed more bracket bond failure than patients with normal over bite. This study agreed with the previous study by Atashi[15] which showed more debondings in patients with deep bite. The higher bracket bond failure in patients with deep bite may be due to the stronger masticatory forces in these patients as compared to the patients with normal overbite or open bite.

Bracket bond failure in our patients with normal overbite (10%) was comparable with the results of previous international studies[16] but did not match with the debondings reported in our patients with deep bite (76 %). In a national study by Rasool,[5] bracket bond failure was found 59.3 % and in our study overall bracket debonding found in the whole sample (patients with deep bite as well as with normal overbite) was 43%, which was very high than the bracket debonding reported in international studies. The reasons for this difference may include improper care of brackets and failure to follow proper dietary instructions by our population in addition to other reasons.

In our study dental class II patients showed more debonding as compared to other types of malocclusion. This agreed with a previous study by Bherwani[4]. Atashi[15] on the hand found no difference in frequency of debonding in various types of malocclusions. Our research findings demonstrated that debonding was more common in maxillary arch as compared to mandibular arch. These results agreed with the previous research by Rasool,[5] however, did not agree with the previous studies by Sukhia[1] and Pseiner[17] which concluded more bracket bond failure in mandibular arch as compared to maxillary arch. Marquezan[18] has reported equal bracket breakage in both maxillary and mandibular arches.

There were more debonding in buccal segment than labial segment in the present study. Previous studies by Sukhia[1] and Purmal[19] also showed greater bracket bond failure in buccal segment. This may be due to greater magnitude of masticatory forces in posterior segment as compared to the anterior segment.[20]

Most common tooth for bracket bond failure was second premolar which might be because of difficulty in moisture control, reaching the buccal surface of the tooth and presence of aprismatic enamel.[21]

In our study debonding rate in female patients was more as compared to male patients. This was in agreement with the previous studies by Rasool[5] and Liu.[22]However; studies by Sokucu[23] and Leizer[24] have indicated more bracket breakage in male subjects as compared to the female subjects. Research by Moninuola[25] has shown equal distribution of bracket debonding in both gender subjects.

In the present study, teens showed more bracket debonding than adult patients. Previous studies by Rasool[5], Ammar[26] and Yang [27] have also shown more bracket bond failure in young patients as compared to adult patients. This could be due to increased level of self-awareness and greater motivation for esthetic

improvement in adults as compared to teens. The difference in the results of this study and other studies may be due to the difference in the sample size, material used for bonding and in type of brackets used. Limitation of this study were; not considering the reasons for brackets bond failure which apart from other factors also include magnitude of masticatory forces associated with various facial types, dietary habits, other characteristics of malocclusion and type of mechanics involved during the treatment.

It is clear from this study that while bonding brackets in patients with deep bite strict clinical guidelines must be followed as chances of bracket bond failure is greater in patients with deep bite.

CONCLUSION:

It was concluded that bracket debonding was more common in patients with deep bite and most common site for frequent debonding was maxillary arch and buccal segment. Second premolar was the tooth which showed most frequent bracket bond failure.

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