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In Vitro Comparison of Shear Bond Strength Between Clarity Bracket and Transcend Ceramic Bracket

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ABSTRACT

Ceramic brackets were introduced because of increasing aesthetic demands. **Objective:** The purpose of the present research was to find out and do comparison of the shear bond strength and bond failure location of clarity ceramic and Transcend brackets. **Setting:** This comparative study was conducted at department of Orthodontics, de'Montmorency College of dentistry, Lahore. **Methodology:** Fifty brackets of each type were bonded to 100 extracted first premolar teeth with the similar bonding system. Each bracket type was tested on a Schimadzu testing machine to investigate the debonding force levels. Optical stereo microscope was used to evaluate the Adhesive Remnant Index (ARI). **Conclusion:** It was concluded that Shear bond strength and ARI scores differences between the Clarity and Transcend ceramic brackets are insignificant.

Keywords: Shear bond strength, Clarity, Ceramic

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INTRODUCTION

Bonding of brackets on to the tooth surface is one of the key steps in orthodontic practice.[1] Ceramic brackets were introduced because of increasing aesthetic demands.[2] Ceramic brackets bond strength should be brave enough to keep these attachments on teeth while whole of orthodontic treatment, but should not be strong enough to cause tooth enamel fracture while debonding.[3] Different debonding methods for ceramic brackets include fine pliers, electro thermal, ultrasonic and laser.[3]

Mini metal brackets, lingual brackets, clear aligners, plastic and ceramic brackets were manufactured in an attempt to meet demand of orthodontic patients that are concerned with mini-aesthetics while orthodontic therapy. In 1970s, plastic brackets were introduced as an aesthetic alternative to metal brackets, but discontinued soon because of discoloration and mechanical weakness issues. Following this, plastic brackets were modified by reinforcing of slots with metal and ceramic fillers, but clinical complications like bracket damage and discoloration persisted.[4] In the mid 1980s, monocrystalline and polycrystalline ceramic materials came into the orthodontic market, that were without clinical complications like bracket damage and discoloration.

Ceramic brackets also got certain disadvantages such as high friction, low bond strength, low fracture resistance and increased frictional resistance between metal archwires and ceramic brackets. In order to cover these disadvantages, ceramic bracket having stainless steel slot was introduced. The advantage of having a stainless steel slot includes:[5,6] Minimization of the increased friction, increased bracket strength and ability to withstand routine orthodontic torque forces.

In literature no significant difference were found while comparison of the amount of force require to debond clarity brackets and metal brackets.[7]The purpose of the current research was to quantify and do comparison of the bond strength and failure sites of ceramic brackets.

METHODOLOGY

A comparative study was conducted on 100 brackets (fifty Transcend 3M-Unitek and fifty Clarity 3M-Unitek, in each group), at Orthodontic department, de'montmorency, College of Dentistry, Lahore, during January 2016 to January 2017. Intact extracted first premolar teeth extracted for orthodontic reasons were selected to be bonded using light cure composite (Trans bond XT). All bonded samples were kept in normal saline at 37°C for 42 hours. Bonded teeth were left uninterrupted

for 30 minutes and kept in synthetic saliva for one day at 37°C.

Inclusion Criteria

Freshly extracted first premolars preserved first premolars teeth with intact surfaces

Exclusion Criteria

Decayed, broken down premolars patients with any previous fixed orthodontic therapy

Data Collection Procedure

Thermal cycling of all specimens was performed at temperatures from 5°C. Brackets were tested on Schimadzu machine, to determine the shear debonding strength. Spots of post debonding bracket failure were visualized by using the optical microscope with 30x magnification. The quantity of residual adhesive was evaluated according to the adhesive remnant index (ARI).

Statistical Analysis

The data was analyzed in Statistical Package for the Social Sciences software package (SPSS) 20. Chi square test was applied to evaluate intra-group differences.

RESULTS

Mean values and comparison of the shear bond strength of the Clarity and Transcend ceramic Brackets are shown in Table 1. The independent t-test performed for comparing the clarity and transcend ceramic brackets, indicated that there were no statistically significant difference between two brackets tested (P=0.243). The Adhesive Remnant Index scores for the deboned brackets are presented in Table 2. Result indicated that there were no significant differences between ARI scores for two brackets. (P=0.312).

Table 1: Comparison of the shear bond strength (MPa) of the Clarity bracket and Transcend ceramic Bracket

	Clarity	Transcend
N	50	50
Minimum	11.32	10.11
Maximum	36.82	25.11
Mean	21.3561	16.4132
S.D	4.5678	3.6789
Variance	26.123	12.734

Table 2: Adhesive remnant index (ARI) of the clarity bracket and transcend ceramic bracket after Debonding

	Clarity	Transcend
N	50	50
ARI Score 1	55	53
ARI Score 2	4	3
ARI Score 3	2	3
ARI Score 4	0	0
ARI Score 5	0	0

DISCUSSION

Ceramic bracket having stainless steel slot was introduced to minimize the increased friction, to Increase the bracket strength, and to withstand routine orthodontic forces. The shear bond strength of these metal lined ceramic and conventional ceramic brackets were evaluated in present research. The results of the current research found that clarity brackets have a similar mean bond strength scores to that of the Transcend ceramic brackets. Various researchers have studied bonding strengths of different brackets and the results differ noticeably.[8-10]

Olsen, Bishara and Jakobsen found that bond strength observed for the ceramaflex bracket was considerably less than the transcend bracket.[11] The ARI scores for both clarity and conventional ceramic brackets showed a similar bond failure pattern i.e. all adhesive remains on tooth surface. The result of the present research are in agreement with Olsen, Chaudhary, and Bakhadher who found that entire bonding material remained on tooth surface.[11-13]

Multiple factors can influence bond strength scores, namely, geometric form of bracket base, nature of composite used, condition of the enamel surface,[14] and adhesive forces. [15,16]

Further research is recommended to determine the debonding character of clarity brackets when removed with instruments designed especially for this purpose.

CONCLUSION

Shear bond strength and ARI scores between the Clarity bracket and Transcend ceramic bracket were insignificant.

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