ORIGINAL ARTICLE

COMPARISON OF SHEAR BOND STRENGTH OF MOISTURE INSENSITIVE PRIMER AND CONVENTIONAL PRIMER

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ABSTRACT

There are controversial results in the published literature about the use of primers on bonding strength of orthodontic brackets. The purpose of this study was to compare the mean shear bond strength of orthodontic brackets cured with or without the prior application of primer resins. Sixty extracted first premolars were included. In group MP, 30 teeth were cured using standardized bonding protocol including application of moisture insensitive primer resin while 30 teeth in group P were cured using standardized bonding protocol, including a step of application of conventional primer resins. Later on bonding strength was measured using universal testing machine and student's t-test was used for comparison of bond strength in both the groups. Results revealed that although bond strength values were higher in MP group but statistically insignificant differences were found in bond strength in both the groups (p 0.079). It is concluded that there is no statistically significant difference in the shear bond strength of orthodontic brackets cured with moisture insensitive primers or with conventional primers in our present study.

Key Words: *Shear bond strength; Moisture insensitive primer.*

INTRODUCTION

The bonding of orthodontic brackets on tooth surface is a key step in any orthodontic therapy, as strong bonding between tooth and bracket is one of the keys for any orthodontic therapy to be called as successful and efficient.[1] Repeated bond failures in orthodontic brackets results in longer therapy duration, increased overall treatment cost and decreased patient compliance.[2-4]

Modern orthodontic bonding has evolved through different phases.[5] The conventional primers consist of bis-phenol A glycidal methacrylate (Bisgma) resins, which are hydrophobic in nature,[6] while moisture insensitive primers consists of hydrophilic components, such as hydroxyethyl methacrylate (HEMA) and maleic acid dissolved in acetone,[7,8] that works efficiently even in moist conditions.

Nonetheless, application of primer while bonding orthodontic brackets is still controversial. Results of various in-vitro studies have revealed that there is no difference in orthodontic bond strength with or without primer use.[9,10] Similarly, results of various ex-vitro studies have also revealed that there is no difference in orthodontic bond strength with or without primer use.[11-13]

Rationale of present study is to test the effect of moisture insensitive primers in comparison with conventional primers on shear bond strength of orthodontic brackets. Review of published orthodontic literature showed a very few Pakistani studies on the subject of difference in shear bond strength of orthodontic brackets cured with these two primers. Results may be different in the present study because of difference in nature of primer agent used and operator related factors. Therefore, the aim of present in-vitro study was to compare the mean shear bond strength of orthodontic metal bracket cured with moisture insensitive primers and orthodontic brackets cured with conventional primers.

METHODOLOGY

This In-vitro research was conceived from December 2016 to October 2017 at the Orthodontic department, Faisalabad medical university and de'Montmorency College of dentistry, Lahore. Thirty human extracted premolars were selected and preserved in 0.1% thymol, based on following inclusion criteria: Extraction because of orthodontic reasons, complete root formation, intact

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buccal surface, no tooth wear or caries of any surface. Teeth having a history of orthodontic bonding or any sort of dental pathology, involving the buccal surface were excluded.

Sixty teeth were divided in to 2 groups randomly, using random number table method. In group MP, 30 teeth were cured using standardized bonding protocol including application of moisture insensitive primer resin while 30 teeth in group P were cured using standardized bonding protocol including step of application of conventional primer resins.

Bonding was done by one specialist operator by following these steps: 1. Cleaning and polishing 2. Etching using 37% hydrophosphoric acid for 30 seconds 3. Rinsing and air drying for 30 seconds 4. Orthodontic primer MIP (Transbond, Moisture insensitive primer, 3M-Unitek) was light cured in group MP teeth while in group P conventional primer (Transbond XT, 3M Unitek) was used, 5. Premolar brackets (3M-Unitek) with 11.35 mm2 area were bonded using light cure orthodontic adhesive (3M Unitek) for one minute.

Samples were stored in normal saline for 72 hours at 37°C and thermocycled 1000 cycles, between 5°C and 55°C in each bath. Later on shear bond strength was measured using universal testing machine (Instron Corp) in both the groups.

Shear bond strength values in both the groups were calculated and presented in the form of mean and standard deviation and paired t-test was applied for comparison of mean bond strength in both the groups. In addition, 95% confidence intervals were calculated. Data were collected and analyzed using software SPSS 19.0.

RESULTS

The mean values of shear bond strength of orthodontic metal brackets bonded in groups P and MP were 11.09 ± 0.49 MPa and 12.49 ± 0.79 MPa, respectively (Table 1). The t-test comparison showed insignificant difference between the two groups (p = 0.079) (Table 2).

DISCUSSION

Moisture insensitive primers consist of hydrophilic components, such as HEMA and maleic acid that works efficiently even in moist conditions.[7,8] The aim of current in-vitro study was to compare the mean shear bond strength of orthodontic metal brackets cured with two types of primers. The result of this present study revealed that although the bond strength values were higher in the MP primer group, these differences were not statistically significant.

Primers are basically composed of unfilled resin particles.[14] Findings of current in-vitro study are in agreement with the findings of recently conducted randomized controlled trial where it was found that application of primer got no clinically significant influence on failure rate of metal brackets in a clinical setting over an 18 month follow up.[15] However, findings of current study are in contrast with the findings of another recently conducted randomized controlled trial where it was found that application of primer got statistically significant difference in the adhesive remnant index.[12] Results may be different in the present study because of in-vitro nature, difference in nature of primer agent used i.e. moisture insensitive primers and difference in the storage medium used.

Results of the present study are in accordance with the previously conducted local study by Haq et al.[16] However there were certain methodology differences of present study with that of Haq et al, namely, use of moisture insensitive primer in the present study and difference in the storage medium used. Katrina in 2010 showed that water storage has deleterious effects on mean values of shear bond strength,[17] the samples in our study were stored in normal saline after bonding that might have increased the bond strength values obtained in our study, while the storage medium used in study of Haq et al was distilled water.[16]

TABLE I: COMPARISON OF BOND STRENGTH (MPa) IN THE TWO GROUPS

		Study Groups	
		Group P	Group MP
Shear bond strength (MPa)	n	30	30
	Mean	11.09	12.49
	SD	0.49	0.79

p-value = 0.079 (Insignificant)

TABLE 2: COMPARISON OF BOND STRENGTH WITH TWO TYPES OF PRIMER APPLICATION

	t-test					
					95% Confidence interval of the Difference	
	t	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Shear bond strength (MPa)	0.079	0.082	1.0489	1.698	0.5845	0.8956

There are several limitations of this in-vitro study, such as, small sample size and in-vitro studies cannot reproduce real time intra-oral environment in which contamination by blood or saliva can influence bond strength values.[18,19] Further large scale in-vivo studies are suggested to compare the mean shear bond strength of orthodontic metal bracket cured with moisture insensitive primers and orthodontic brackets cured with conventional primers.

CONCLUSION

It is concluded that there is no statistically significant difference in the shear bond strength of orthodontic brackets cured with moisture insensitive primers or with conventional primers in our present study.

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3 Fareena Ghaffar: Title, abstract, data analysis and recording.