The Evaluation Shear Bond Strength of Four Different Self-etching Adhesive Systems On Dentine In Primary And Permanent Teeth : In Vitro Study

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Introduction

Developments in adhesive dentistry have led to fundamental changes in the dental practice these changes are expected to increase with the development of new self etching adhesive systems. These adhesives have most important advantages such as less technique sensitive, less time consuming, a reduce number of clinical procedural steps, and as effective as older total-etch adhesives. The newly developed adhesives should be tested before entering the market. For this purpose can used in vitro experiments simulating clinical conditions. According to the results of these tests are assessed adhesive materials and its give an idea of practitioners about the success of adhesive. In case of failure, improvements could be made. The purpose of this *in vitro* study was to evaluate the dentine shear bond strength of four different self-etching adhesive materials in primary and permanent teeth.

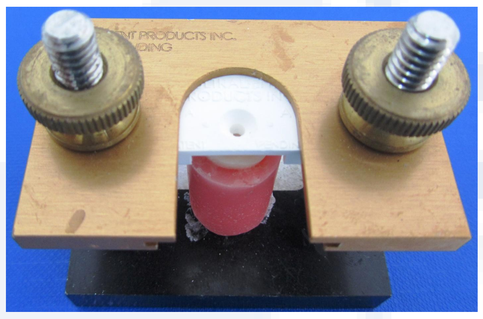
Materials and methods:

60 extracted, caries-free, permanent third molars and 60 extracted primary second molars with sound crown were used in this study. Teeth were disinfected in 0.5% chloramine solution and placed in distilled water. To remove enamel, grinding was employed using 320-grit silicon carbide abrasive papers under running water using the flat dentine surfaces of the teeth were then polished with 600, 800 and 1000 grit silicon carbide papers on an abrasive machine (Phoenix Beta, Buehler, Germany) under running water before bonding the procedure (figure 1).

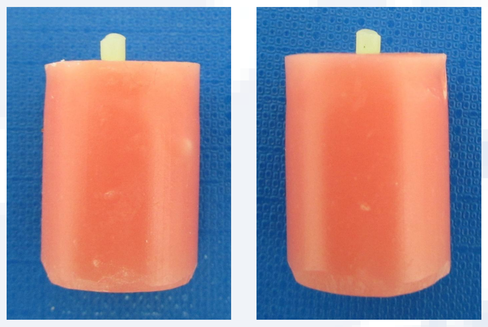
Different self-etch dentin bonding agents were applied to each subgroup: In Group I (Futura Bond), in Group 2 (G-Bond), in Group 3 (Adper Prompt-L-Pop) and in Group 4 (Clearfil S³ Bond) system were used on both permanent and primary dentin. A halogen light curing unit (Hilux 200, Benlioglu Dental Inc, Ankara, Turkey) with a light intensity of 400 mW/cm2 was used. After the application of permanent teeth dentine bonding agents, a resin composite material (Z250 Restorative A2, 3M ESPE, St Paul, MN, USA) and primary teeth dentine (Dyract Extra A2, Dentsply, Germany) was applied on to the prepared dentin surfaces (figure2, 3).

All specimens were stored in distilled water at 37ºC for 24 hours. The specimens were debonded using an universal testing machine at a crosshead speed of 1mm/min at room temperature (23±2ºC). Shear bond strengths were calculated by dividing the highest fracture force (N) with the bonded area (diameter 2.34 mm) and converted to megapascals (MPa) (figure 4). After the application of shear bond strengths to resin-dentin bonded surfaces and specimens were debonded, failure modes were recorded. There were three types of fracture in all groups: 1) Adhesive failure: The failure at the interface was between resin and dentine. 2) Mixed failure: The failure was partially adhesive and partially cohesive resin fractures and/or dentine fracture. 3) Cohesive failure: The failure was in the resin or dentine.

Figure 1. Flat dentine of permanent and primary teeth (ready for application)



Resim 2. Special device for application



Resim 3. 2.34 mm diameter specimen were obtained.

Resim 4. Universal bond strength test machine

Results

The mean shear bond strength values measured in Newton and converted MPa along with their standard error for all groups are presented in Table 1. Besides, recorded failure modes as percentages are given in Table 2. Note that the percentages were calculated by dividing the count in a cell by the number of observations in each subgroup. Higher bond strength values were obtained for permanent dentin.
There was statistical difference between primary teeth shear bond strength values (P >0.05). Therefore; besides of not appear as statistically significant difference, Clearfil S³ Bond indicated the best performance in both the primary teeth and permanent teeth.

Tablo 1. Permanent and primary teeth shear bond strength values

Self-etching adhesives	N	Permanent teeth*	Primary teeth*	*P-values*
		Mean ± SD (MPa)	Mean ± SD (MPa)	
G Bond	15	17.36 ± 0.75a	9.36 ± 0.48c	0.01
Futurabond M	15	17.26 ± 1.22a	12.67 ± 1.08bc	0.01
Adper Prompt L-Pop	15	14.66 ± 0.43a	12.47 ± 1.08bc	0.07
Clearfil S³Bond	15	18.07 ± 0.58a	14.49 ± 1.07b	0.01
P-values		0.17	0.01	

Tablo 2. Types of fracture of permanent and primary teeth

Types of fracture	Permanent teeth				Primary teeth			
	G-Bond	Futura Bond M	Adper Prompt-L-Pop	Clearfil S³ Bond	G-Bond	Futura Bond M	Adper Prompt-L-Pop	Clearfil S³ Bond
Adhesive	14(%93)	15(%100)	15(%100)	15(%100)	15(%100)	15(%100)	14(%93)	14(%93)
Cohesive	1(%7)	0	0	0	0	0	1(%7)	0
Mixed	0	0	0	0	0	0	0	1(%7)
Total	15	15	15	15	15	15	15	15

Conclusions

The adhesive systems used in primary teeth showed lower bond strength. The bonding systems in primary teeth are needed to develop and Clearfil S³ bond as a self-etching adhesive system will be better to use primary teeth.