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Original Research

Comparison of Effect of salivary contamination on the dentin bond strength of two different adhesive systems

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***ABSTRACT*:**
Background: The increasing popularity of dental composites has drawn attention to the importance of moisture and contamination control. Adhesion to dentin has been the subject of debate due to its heterogeneous nature, with much higher organic and water content than enamel. Hence; the present study was conducted for comparing the effect of salivary contamination on the dentin bond strength of two different adhesive systems. **Materials & methods:** A total of 40 freshly extracted mandibular premolars were included in the present study. With the help of a high-speed hand piece, occlusal surfaces of the teeth were reduced at a depth of 1.5 mm from the cuspal tip. After removal, random division of all the specimens was done into following study groups as follows: Group A: Application of Adper Easy One (3M ESPE) to dentin surface followed by light curing, Group B: Application of Adper Easy One (3M ESPE), saliva application, air dried followed by light curing, Group C: Application of Xeno V (Dentsply) to dentin surface followed by light curing, and Group D: Application of Xeno V (Dentsply) saliva application, air dried followed by light curing. Universal force testing machine was used for assessing the shear bond strength. **Results:** Mean shear bond strength among specimens of Group A and group C was found to be 8.66 MPa and 6.83 MPa respectively. Mean shear bond strength among specimens of Group B and group D was found to be 3.45 MPa and 2.07 MPa respectively. While analysing statistically, it was observed that mean shear bond strength of specimens of Adper Easy One (3M ESPE) group was significantly higher in comparison to the specimens of Xeno V (Dentsply) group (p- value < 0.05). Also, saliva contamination resulted in significant reduction in shear bond strength of both the adhesive systems. **Conclusion:** Salivary contamination results in significant reduction in the dentin bond strength of adhesive systems.
Key words: Dentin bond strength, Adhesives, Salivary.

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INTRODUCTION

The increasing popularity of dental composites has drawn attention to the importance of moisture and contamination control. The difficulty of achieving moisture control is a common problem encountered in restorative dentistry. For decades, it has been a clinically accepted requirement, in case of salivary contamination, to re-prepare enamel and dentin prior

to proceeding with the adhesive technique. For many years the use of a rubber dam for proper isolation and prevention of cavity contamination have been recommended.[1- 3] Adhesion to dentine has been a subject of considerable interest because it is a more heterogeneous substrate with much higher organic and water content than enamel. The condition of the tooth structure and the chemical composition of the adhesive agent have shown to affect the bond strength. Hence, improving adhesive restorative materials has been the objective of research in the recent years.[4]

Adhesion to dentin has been the subject of debate due to its heterogeneous nature, with much higher organic and water content than enamel. The chemical composition of the adhesive agents and the condition of the tooth structure affect their bond strength. In order to obtain successful adhesion between resin composite and tooth structure, it is necessary that the adhesive substrate should not be contaminated with fluids, such as saliva, blood, plasma, saline or debris from temporary cements. Sites at or near the gingival margins can be easily contaminated with saliva or gingival crevicular fluid.[5- 7] Hence; the present study was conducted for comparing the effect of salivary contamination on the dentin bond strength of two different adhesive systems.

MATERIALS & METHODS

The present study was conducted for comparing the effect of salivary contamination on the dentin bond strength of two different adhesive systems. A total of 40 freshly extracted mandibular premolars were included in the present study. After extraction, cleaning of all the tooth specimens was done for removing any residual tissue tags followed by storing in normal saline. Afterwards, all the specimens were embedded in resin blocks till the cervical regions. With the help of a high-speed hand piece, occlusal surfaces of the teeth were reduced at a depth of 1.5 mm from the cuspal tip. After removal, random division of all the specimens was done into following study groups as follows:

- Group A: Application of Adper Easy One (3M ESPE) to dentin surface followed by light curing,
- Group B: Application of Adper Easy One (3M ESPE), saliva application, air dried followed by light curing,
- Group C: Application of Xeno V (Dentsply) to dentin surface followed by light curing,
- Group D: Application of Xeno V (Dentsply) saliva application, air dried followed by light curing.

After the finishing of the bonding procedures, placement of plastic tubes of 2 mm diameter and 2 mm height was done on each specimen and resin composite was packed, and light cured. Removal of the plastic tubes was done followed by placement in distilled water for simulating the oral environment. Universal force testing machine was used for assessing the shear bond strength. All the values were recorded in Microsoft excel sheet followed by evaluation by SPSS software. Mann-Whitney U test was used for evaluation of level of significance.

RESULTS

In the present study, a total of 40 freshly extracted mandibular premolars were included. Random division of all the specimens was done into following study groups as follows: Group A: Application of Adper Easy One (3M ESPE) to dentin surface followed by light curing, Group B: Application of Adper Easy One (3M ESPE), saliva application, air dried followed by light curing, Group C: Application of Xeno V (Dentsply) to dentin surface followed by light curing, and Group D: Application of Xeno V (Dentsply) saliva application, air dried followed by light curing. Mean shear bond strength among specimens of Group A and group C was found to be 8.66 MPa and 6.83 MPa respectively. Mean shear bond strength among specimens of Group B and group D was found to be 3.45 MPa and 2.07 MPa respectively. While analysing statistically, it was observed that mean shear bond strength of specimens of Adper Easy One (3M ESPE) group was significantly higher in comparison to the specimens of Xeno V (Dentsply) group (p- value < 0.05). Also, saliva contamination resulted in significant reduction in shear bond strength of both the adhesive systems.

Table 1: Shear bond strength

Groups	Mean (MPa)	SD
Group A	8.66	3.22
Group B	3.45	1.27
Group C	6.83	2.46
Group D	2.07	1.01

Table 2: Effect of salivary contamination on Shear bond strength

Groups	U value	p- value
Group A Vs Group B	234.15	0.001*
Group C Vs Group D	320.87	0.000*

*: Significant

Table 2: Comparison of shear bond strength among both the bonding agents

Groups	U value	p- value
Group A Vs Group C	115.4	0.015*
Group B Vs Group D	148.4	0.028*

*: Significant

DISCUSSION

With the increasing demand for esthetics, composite restorations are now the most promising tooth-colored materials. Bonding to enamel is by micromechanical retention followed by the acid etching procedure while adhesion to dentin has always been a subject of interest owing to its complex nature. Over the past 45 years, dentin bonding agents have evolved with variation in its chemistry, application, mechanism, technique, and effectiveness. In continuity for a better adhesion, a number of studies are being conducted to improvise these adhesive systems. Dentin bonding systems have been shown to be sensitive to contamination with saliva and plasma. Both immediate and long term bond strengths under intra oral conditions are crucial for good clinical performance of adhesive restorations therefore there is a need to evaluate the effect of contamination on the effect of bond strength of this adhesive systems.[8- 10] Hence; the present study was conducted for comparing the effect of salivary contamination on the dentin bond strength of two different adhesive systems.

In the present study, mean shear bond strength among specimens of Group A and group C was found to be 8.66 MPa and 6.83 MPa respectively. Mean shear bond strength among specimens of Group B and group D was found to be 3.45 MPa and 2.07 MPa respectively. M E Johnson et al examined the shear bond strength to dentin of two dentin bonding agents when contaminated with a measured amount of saliva at various stages in their application procedure. Eighty extracted human third molar teeth were randomly separated into four groups of 10 for each of the dentin bonding systems tested (All-Bond 2, Scotchbond Multi-Purpose). Group A specimens were not contaminated; primer/adhesive/resin were applied according to manufacturers' instructions. In Group B, samples were contaminated for 15 seconds with fresh whole human saliva, and then forcibly dried with a blast of oil-free air; this occurred after application of the primer but prior to application of adhesive. In Group C, contamination occurred after application of adhesive, prior to application of resin. In Group D, saliva was allowed to contaminate the surface as the primer was being applied, without forcible removal. Specimens were then thermocycled, mounted, and tested in shear on an Instron at 7 days. Bond strengths in MPa were obtained, and data were analyzed using a one-way ANOVA, at the P = 0.05 level of significance. Although shear bond strengths were lowered in saliva-contaminated samples, there was no statistically significant difference between group means.[11]

In the present study, while analysing statistically, it was observed that mean shear bond strength of specimens of Adper Easy One (3M ESPE) group was significantly higher in comparison to the specimens of Xeno V (Dentsply) group (p- value < 0.05). Also, saliva contamination resulted in significant reduction in shear bond strength of both the adhesive systems. Suryakumari NB et al evaluated the effect of salivary contamination on the bond strength of one-bottle adhesive systems - (the V generation) at various stages during the bonding procedure and to investigate the effect of the contaminant removing treatments on the recovery of bond strengths. In this study the V generation one-bottle system - (Adper Single Bond) was tested. Fifty caries-free human molars with flat dentin surfaces were randomly divided into five groups of ten teeth each: Group I had 15 second etching with 35% Ortho Phosphoric acid, 15 second rinse and blot dried (Uncontaminated); Group II contaminated and blot dried; Group III contaminated and completely dried; Group IV contaminated, washed, blot dried; Group V contaminated, retched washed, and blot dried. There was a significant difference between the group that was dried with strong oil-free air after contamination (Group III) and the other groups. When the etched surface was contaminated by saliva, there was no statistical difference between the just blot dry, wash, or the re-etching groups (Groups II, IV, V) if the dentin surface was kept wet before priming. When the etched dentin surface was dried (Group III) the shear bond strength decreased considerably. The bond strengths to the tooth structure of the recent dentin bonding agents are less sensitive to common forms of contamination than assumed.[12]

Silverstone et al have reported that saliva contamination of etched enamel caused a significant decrease in bond strength between the resin and enamel surface. It was suggested that the contamination of etched enamel by salivary proteins prevented monomers from penetrating the pores in enamel, which reduced the bond strength. Microscopic examination of saliva contaminated acid-etched enamel showed the formation of an organic pellicle that could not be removed with water. The organic pellicle coating masked the underlying enamel pores, decreased resin accessibility and impaired mechanical adhesion. However, the contaminated enamel could be reconditioned by an additional 10 seconds of acid etching.[13- 15]

CONCLUSION

From the above results, the authors conclude that salivary contamination results in significant reduction

in the dentin bond strength of adhesive systems. Hence; adequate care should be taken while applying adhesive agents.

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