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# Original Research

## Effect on micro tensile bond strength of self etch universal adhesive on dentine irrigated using different irrigants

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***ABSTRACT:***

**Background**: This study was conducted to assess the effect on micro tensile bond strength of self-etch adhesive on dentine irrigated using different irrigants. **Material and methods**: This study utilized a collective of 30 molars. The study excluded teeth that exhibited hypo-plasticity, hypo-mineralization, restorations, and crown fractures. A total of 30 undamaged human molars were utilized and categorized into 3 groups based on the irrigants used. A self-etch universal adhesive method was employed for the composite restoration. The construction of resin composites was achieved by utilizing the Tetric N Bond Universal adhesive method. The microtensile bond strength was assessed using a Universal Testing Machine. The collected data was organized and inputted into a spreadsheet using Microsoft Excel. It was subsequently exported to the data editor of SPSS Version 20.0. The statistical analysis of the data was conducted using the software SPSS (version 20.0) and Microsoft Excel. **Results**: The mean bond strength of group 1 adhesives was 21.3 while the mean bond strengths of group 2 and 3 were 27.9 and 30.5, respectively. **Conclusion**: the control group showed the least bond strength as compared to the other 2 groups.
**Keywords**: tensile strength, bond strength, self-etch adhesives, irrigants, dentin.

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### INTRODUCTION

Erosion is a chemically induced, irreversible loss of dental hard tissue by endogenous or exogenous acids not produced by microorganisms.[1] Extrinsic acids supplied to the body by diet, medication or occupation, as well as intrinsic acid (gastric juice) entering the oral cavity through vomiting or reflux, may be responsible for erosive damage.[2] In the initial phase of the erosive process, the protons released by the acids react with the carbonate or phosphate of the enamel apatite, thus destabilizing the enamel crystals and causing the dissolution of dental minerals.[3] Advanced erosion can also affect the dentin, whereby the irreversible loss of substance is accelerated when the eroded dental hard tissues are exposed to additional abrasive processes such as tooth brushing.[4]

Adhesion to dentin is influenced by many factors. During root canal treatment, the use of chemical irrigants changes the chemical composition of the dentin surface.[5] Furthermore, the pulp chamber dentin is exposed to a series of irrigants with different wettability, surface tension, and chelating effects that result in the alteration of its mineral and organic contents as well as its surface energy.[5] Therefore, after irrigation, the dentin tissue may possess irreversibly altered properties that have an impact on its interaction with the material used for coronal sealing.[6] This adhesion mostly involves the cut surface of coronal dentin with a flat surface, smear layer, and smear plugs within the dentin tubules. However, being a complex structure, pulpal floor dentin consists of primary dentin and regular and irregular secondary dentin.[7]

Hence, thisstudy was conducted to assess the effect on micro tensile bond strength of self etch adhesive on dentine irrigated using different irrigants.

### MATERIAL AND METHODS

This study utilized a collective of 30 molars. The study excluded teeth that exhibited hypo-plasticity, hypo-mineralization, restorations, and crown fractures. A total of 30 undamaged human molars were utilized and categorized into 3 groups based on the irrigants used. A self-etch universal adhesive method was employed for the composite restoration. The construction of resin composites was achieved by

utilizing the Tetric N Bond Universal adhesive method. The microtensile bond strength was assessed using a Universal Testing Machine. The collected data was organized and inputted into a spreadsheet using Microsoft Excel. It was subsequently exported to the data editor of SPSS Version 20.0. The statistical analysis of the data was conducted using the software SPSS (version 20.0) and Microsoft Excel.

**The groups were:**

a) Control group (Group1): dentine surface was irrigated with Sodium hypochlorite(NaOCl) followed byEDTA.
b) Group 2: irrigants used were Sodium hypochlorite followed by 18% HEDP
c) Group 3: irrigants used were Sodium hypochlorite followed Grape Seed Extract.


**RESULTS**

**Table 1: Comparison based on micro-tensile bond strength in three groups.**

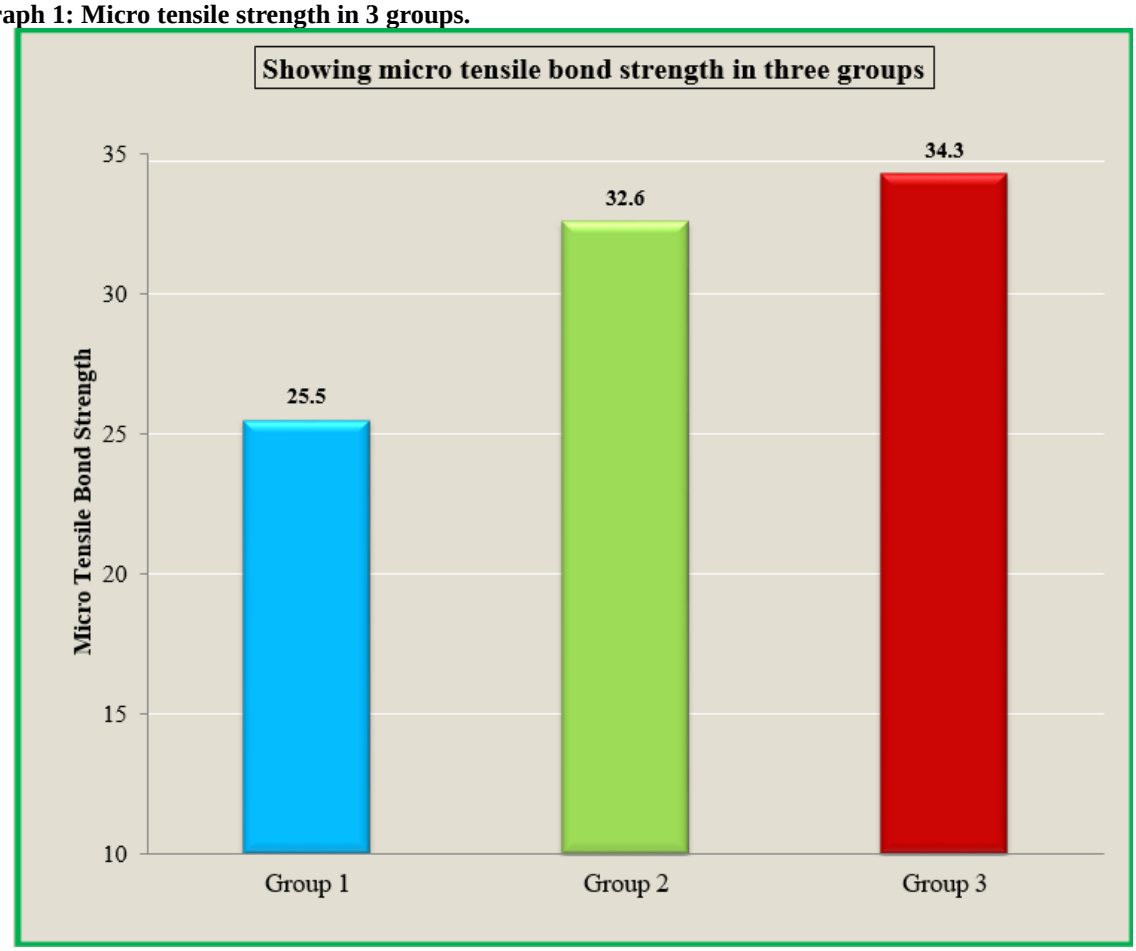
| Groups | Number of teeth | Mean | SD | P-value |
|---|---|---|---|---|
| Group 1 | 10 | 21.3 | 2.03 | <0.001* |
| Group 2 | 10 | 27.9 | 2.14 | |
| Group 3 | 10 | 30.5 | 2.69 | |

The mean bond strength of group 1 adhesives was 21.3 while the mean bond strengths of group 2 and 3 were 27.9 and 30.5, respectively.

**Table 2: Intergroup comparison based on micro tensile bond strength in three groups.**

| Group comparison | Mean difference | P-value |
|---|---|---|
| Group 1 vs Group 2 | 6.2 | <0.001* |
| Group 1 vs Group 3 | 7.3 | <0.001* |
| Group 2 vs Group 3 | 2.1 | 0.109 |

**Graph 1: Micro tensile strength in 3 groups.**




**DISCUSSION**

Resin cements are widely used for cementing fiber due to their compatibility to adhesive systems. Self-adhesive cements have brought clinical benefits to overcome some limitations of conventional and self-etch resin cements. The system does not require any pretreatment to remove the smear layer from the root canal, and once the cement is mixed the application is done in a single clinical step.[8] Self-adhesive cements simultaneously demineralize and infiltrate enamel and dentin because of multifunctional monomers with phosphoric acid groups.[9] It is claimed that the adhesion obtained relies on micromechanical retention and chemical interaction between monomer acidic groups and hydroxyapatite.[10-12]

Dentine adhesives, which have undergone substantial changes over the last 20 years, are classified into two techniques: self-etch or etch-and-rinse.[13] Etch-and-rinse, the first to be introduced, is the technique that results in the deepest hybrid layer in enamel.[14] Because of the higher number of steps and stronger effect of the etching procedure on dentine substrate, etch-and-rinse technique requires a longer clinical application time, results in increased postoperative sensitivity, and is the more sensitive to failure.[14]

Hence, thisstudy was conducted to assess the effect on micro tensile bond strength of self- etch adhesive on dentine irrigated using different irrigants.

In this study, the mean bond strength of group 1 adhesives was 21.3 while the mean bond strengths of group 2 and 3 were 27.9 and 30.5, respectively.

The aim of the study conducted by Asu Çakir[15] was to evaluate the bond strength of a self-etching adhesive system to dentine irrigated with sodium hypochlorite (NaOCl), chlorhexidine solution (CX) and ethylene diamine tetra acetic acid (EDTA) by microtensile testing. Sixty human third molars were sectioned 3 mm below the occlusal level and then randomly divided into six groups: G1(control), without irrigant solution; G2, 1% NaOCl; G3, 1% NaOCl followed by the application of 17% EDTA; G4, 2% CX; G5, 2% CX followed by the application of 17% EDTA and G6, 17% EDTA. The specimens received the self-etching adhesive system were restored with composite resin, then sectioned and trimmed to obtain four hourglass-shaped slabs from each tooth. The specimens were submitted to the microtensile test in a Universal Testing Machine at a crosshead speed of 0.5 mm min−1 until fracture. The results were submitted to statistical analysis by anova /Newman-Keuls. The means and standard deviations (MPa) were: G1, 26.88 (±3.81); G2, 19.08 (±3.89); G3, 18.16 (±2.21); G4, 18.14 (±4.32); G5, 34.30 (±3.32); G6, 13.61 (±1.21). It was concluded that the application of 2% CX followed by the application of 17% EDTA resulted in increasing the bond strength of

the self-etching adhesive system to dentine, when compared with the results obtained for the other tested groups.

The purpose of the study conducted by Elkabbaney A et al[16] was to evaluate and compare the effect of endodontic irrigation protocols on the micro-tensile bond strength of total-etch and universal adhesives to coronal dentin. Forty teeth were collected and their occlusal surfaces were flattened until middle dentin was exposed. They were divided into four groups according to surface treatment of dentin (untreated (control), NaOCl, EDTA and combination of the two irrigants). Two different adhesives were selected for the current study (total-etch adhesive and universal adhesive). Adhesives were applied according to manufacturers' instructions, then composite restoration was built up incrementally. Resin/dentin specimens were sectioned for micro-tensile bond strength (μTBS) testing. A specimen from each group was randomly selected and investigated under scanning electron microscope (SEM).Regarding the total-etch adhesive; the control group showed the highest value of μTBS, followed by the group irrigated with NaOCl + EDTA, EDTA and NaOCl; respectively. Regarding the Universal adhesive; dentin irrigated with a combination of EDTA+NaOCL was found to give the highest value of μTBS. It was followed by that irrigated with EDTA and control group. Irrigation with NaOCl resulted in a dramatic decrease in the μTBS in comparison with the other groups ($p < 0.001$). The use of a combination of NaOCl and EDTA as a regular endodontic irrigants in dental clinics was found to highly improve the quality of bond strength between dentin and both the total-etch and universal adhesives used for bonding the coronal composite restoration.

## CONCLUSION

It was concluded that the mean bond strength of group 1 adhesives was lesser than that of the other 2 comparative groups.

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