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Original Research

ASSESSMENT OF SHEAR BOND STRENGTH BETWEEN COMPOSITE RESIN AND ENAMEL SURFACE AFTER TREATING WITH ACID ETCHING AND LASER ETCHING: A COMPARATIVE STUDY

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***ABSTRACT*:**
Background: to compare the shear bond strength between acid as well as laser etching on the enamel surface. **Materials and methods:** For this study, 100 freshly removed maxillary canines had been preferred. These had been then randomised principally into two groups: Group 1 underwent acid etching and enamel bonding, while Group 2 received laser etching and enamel bonding. Each group bonded composite to the enamel surface in their own unique way. **Results:** It had been determined that the average shear bond strength for Group I was 59.75 MPa, while the average shear bond strength for Group II was only 28.29 MPa. Analysis of the data showed that the average shear bond strength of the acid etching group had been quite greater as compared to the laser etching group. **Conclusion:** Average shear bond strength of composites bonded with acid etching was higher than that of composites bonded with laser etching.
Keywords: Composite resin, acid etching, laser etching

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INTRODUCTION

Since Buonocore first launched the acid etching technique in 1955, adhesive technology has advanced significantly.[1] Because enamel and dentin are made of different materials, creating an adhesive that bonds well to both can be difficult. Micromechanical interlocking between the resin as well as etched enamel is the foundation of enamel bonding, which has been shown to be both trustworthy and long-lasting. Dentin, on the other hand, presents a greater challenge for bonding due to its varied tubular form, high organic content, as well as positive dentinal fluid flow.[2-4] Dentin bonding has always required the use of multi-step adhesive methods that are both labor-intensive and time-consuming. While multi-step adhesives are capable of producing strong bonds, they are also notoriously finicky in terms of technique, and mistakes in the application process are not uncommon. Therefore, there has been a push for adhesives that are less method-specific and more user-friendly among medical professionals. Manufacturers of dental materials have responded to requests from dental practitioners by creating one-step methods.

However, two issues have been raised that may prevent the widespread adoption of simple step adhesive systems. Many writers have found that acid etching has negative impacts on the bond strength of dentin when employing self-etch adhesives, despite the fact that selective enamel etching is impactful in terms of bond strength when utilizing self-etch adhesives.[5-8] Therefore, they recommended that when employing self-etch adhesives, acid etching be restricted to the enamel only.

Hence, to evaluate and contrast the shear bond strength of composite resin to enamel surface after laser etching as well as acid etching, the present investigation was carried out.

MATERIALS AND METHODS

For this study, 100 freshly removed maxillary canines were used. They were then divided principally into 2 groups:

Group I was treated with acid etching and enamel bonding, while Group II was treated with laser etching and enamel bonding. Each group bonded composite to the enamel surface in their own unique way. After the teeth had been cured, a mild cure bonding chemical was applied. The shear bond strength of every sample had been measured and compared using a universal force measuring machine. After collecting the data, it was stored in Excel spreadsheets and analysed using SPSS.

RESULTS

Table 1: Mean shear bond strength among specimens of both the study groups

Group	Mean shear bond strength (MPa)	p- value
Group I	59.75	0.001(Significant)
Group II	28.29	

It had been determined that the average shear bond strength for Group I was 59.75 MPa, while the average shear bond strength for Group II was only 28.29 MPa. Statistical testing revealed that the acid etching group samples showed considerably higher mean shear bond strength than the laser etching group samples.

DISCUSSION

Dental composite restoration, also known as the laminate procedure or sandwich restoration, utilizes two distinct materials—glass-ionomer cement (GIc) and composite resin—to repair damaged teeth. Resin-modified glass-ionomer cement (RMGIc) or GIc is used in this method to seal the gap between the gingival borders of the reshaped tooth's dentin and the occlusal composite repair.[9,10] A good restoration relies on a solid bond between the GIc and composite. This technique is typically used so that the functional and aesthetic qualities of these materials can be maximized. GIc's spontaneous bonding to dentin and fluoride release are two unique properties that make it a promising material for restorative use. The poor physical-mechanical qualities and aesthetics of these materials are partially mitigated by the composite resin that is applied on top.[11,12] The best bond of composite can be attained by etching the GIC.[13] Shear binding strength between GIC and composite resin could be improved by treating the cement's surface with phosphoric acid (35%).[14] Since GIC's etched surface is porous, it helps strengthen the binding between the two materials.[15] It has been determined that a bonding surface can only be achieved with an etched GIC thickness of 0.5 mm and an etching time of 20 seconds.[16]

Consequently, this investigation was carried out to evaluate and contrast the shear bond strength of composite resin to enamel surface after laser etching and acid etching. The average shear bond strength in this investigation was determined to be 59.75 MPa for Group I and 28.29 MPa for Group II. Analysis of the data showed that the mean shear bond strength of the acid etching group had been quite greater as compared to the laser etching group. Shear binding strength of composite to enamel as well as dentin of primary teeth was tested after being subjected to bur and Er:YAG laser tooth preparation by Bahrololoomi Z et al.[17] One hundred fifty specimens were obtained by mesiodistally sectioning 75 primary molar teeth. Bur preparation + etching (37% H3PO4), laser preparation + etching, and laser preparation without etching were the three treatment groups for both enamel and dentin teeth. All samples were treated with Single Bond adhesive as well as Z250 composite. Except for the non-laser etched groups, enamel specimens had significantly stronger binding strength than dentin specimens. There existed no numerically considerable variation in binding strength among the enamel and dentin laser-non-etched groups. Bond strength had been discovered to be the greatest after bur preparation + etching, followed by laser preparation + etching, as well as lowest after laser preparation without etching (P 0.001). Laser preparation resulted in poorer shear bond strength contrasted to bur preparation in both the enamel as well as dentin groups. Shear bond strength was found to be improved by modest self-etch bonding, as reported by Kandaswamy et al.[18] It's possible that the mild self-etch adhesive's reduced acidity as opposed to the strong as well as intermediate self-etch adhesives is to blame for this. According to organic chemistry, the development of salt crumps is reduced to a minimum if a weak acid invades a substance.[19] Strong ionic reactions are triggered by the presence of non-excited cations like Ca2+ and Na+, which must be present in high concentrations for their interaction to be efficient. This is especially true in a conductive reaction medium like GIC.[20,21] Mild self-etch adhesive appears to have greater shear bond strength due to its reduced acidity.

CONCLUSION

Composites bonded with acid etching had a higher mean shear bond strength than those bonded with laser etching.

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