

ORIGINAL RESEARCH

ASSESSMENT OF EFFECT OF REMINERALIZING AGENT ON BOND STRENGTH OF TWO DIFFERENT TYPE OF RESIN COMPOSITE ON PRIMARY ENAMEL: A COMPARATIVE STUDY

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ABSTRACT:

Background: Dental caries is a prevalent disease worldwide, and composites have become increasingly popular for restoring teeth damaged by caries, largely because of their esthetics. Composite compositions and properties have been substantially improved, yielding longer clinical lifetimes. Hence; the present study was undertaken for assessing effect of remineralizing agent on bond strength of two different type of resin composite on primary enamel. **Materials & Methods:** A total of 50 deciduous incisors were included in the present study. Only those specimens were included in which enamel was intact. All the specimens were broadly divided into two study groups as follows: Group 1: Specimens in which Tetric N-Ceram resin composite was used; and Group 2: Specimens in which Z250 Universal Restorative resin composite was used. In both the groups, shear bond strength was measured at a crosshead speed of 0.5 mm/min and the type of bond failure was recorded. **Results:** Mean bond strength among the specimens of group 1 was found to be 23.96 MPa while mean bond strength of specimens of group 2 was found to be 13.41 MPa. While comparing the mean bond strength in between the two study groups, it was observed that mean bond strength among the specimens of group 1 was higher in comparison to the mean bond strength of specimens of group 2, the results of which were found to be statistically significant. **Conclusion:** Tetric N-Ceram exhibited maximum bond strength as compared to Z250 Universal Restorative.

Key words: Tetric N-Ceram, Z250 Universal Restorative, Remineralizing

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INTRODUCTION

Dental caries is a prevalent disease worldwide, and composites have become increasingly popular for restoring teeth damaged by caries, largely because of their esthetics. Composite compositions and properties have been substantially improved, yielding longer clinical lifetimes. Nonetheless, recurrent caries along the tooth-composite interfaces remains a predominant reason for failure and replacement of restorations.¹⁻³

Successful endodontic treatment relies on effective cleaning and shaping of root canal as well as creation of

an apical seal. However, regardless of the materials and obturation techniques employed, root canal fillings exposed to saliva may become contaminated causing coronal leakage, which is a negative contributor to the prognosis of endodontic treatment. Biomineralization is a dynamic, complex, lifelong process by which living organisms control precipitations of inorganic nanocrystals within organic matrices to form unique hybrid biological tissues, for example, enamel, dentin, cementum, and bone. Understanding the process of

mineral deposition is important for the development of treatments for mineralization-related diseases and also for the innovation and development of scaffolds. Composite resin-based materials have been suggested for the restoration of nonvital teeth because of their benefits such as bonding to dentin by hybrid layer formation and reducing marginal leakage.⁴⁻⁶ Hence; the present study was undertaken for assessing effect of remineralizing agent on bond strength of two different type of resin composite on primary enamel.

MATERIALS & METHODS

The present study was conducted in the department of pedodontics and it included assessment and comparison of effect of remineralizing agents on bond strength of two different type of resin composite in enamel of primary dentition. Ethical approval was obtained from institutional ethical committee and written consent was obtained after explaining in detail the entire research protocol. A total of 50 deciduous incisors were included in the present study. Only those specimens were included in which enamel was intact. All the specimens were broadly divided into two study groups as follows:

Group 1: Specimens in which Tetric N-Ceram resin composite was used;

Group 2: Specimens in which Z250 Universal Restorative resin composite was used

In both the groups, shear bond strength was measured at a crosshead speed of 0.5 mm/min and the type of bond failure was recorded. Voco Remin Pro was remineralizing agent used in the study. All the results were recorded in Microsoft excel sheet and were analysed by SPSS software. Chi- square test and student t test were used for assessment of level of significance. P value less than 0.05 was regarded as significant.

RESULTS

In the present study, a total 50 deciduous incisors were analysed. All the specimens were broadly divided into two study groups as follows: Group 1: Specimens in which Tetric N-Ceram resin composite was used; and Group 2: Specimens in which Z250 Universal Restorative resin composite was used. Voco Remin Pro was remineralizing agent used in the study. Mean bond strength among the specimens of group 1 was found to be 23.96 MPa while mean bond strength of specimens of group 2 was found to be 13.41 MPa. While comparing the mean bond strength in between the two study groups, it was observed that mean bond strength among the specimens of group 1 was higher in comparison to the mean bond strength of specimens of group 2, the results of which were found to be statistically significant.

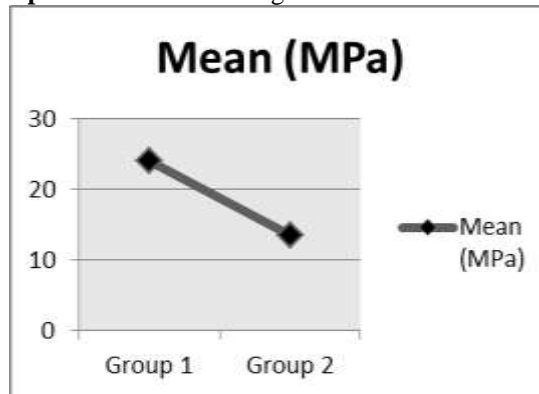
DISCUSSION

Dental resins containing calcium phosphate (CaP) filler particles were developed with remineralizing capabilities. The CaP particle sizes ranged from about 1 µm to 55 µm in traditional CaP-containing resins. These composites released supersaturating levels of calcium (Ca) and phosphate (P) ions and were shown to remineralize tooth lesions in vitro. One study showed that whisker-reinforced CaP composite, which was proposed for use in atraumatic restorative treatments (ART composite), remineralized natural dentin as well as dentin with artificial caries. To improve the load-bearing properties, a stronger barium-glass filler was also incorporated into a composite containing amorphous calcium phosphate (ACP), yielding improvement in flexural strength and elastic modulus, with no adverse influence on ion release profiles.⁷⁻⁹ Hence; the present study was undertaken for assessing effect of remineralizing agent on bond strength of two different type of resin composite on primary enamel.

Table 1: Comparison of bond strength

Bond strength	Group 1	Group 2
Mean (MPa)	23.96	13.41
SD	5.42	4.33
t-statistics	-1.889	
p- value	0.00032	

Graph 1: Mean bond strength



In the present study, a total 50 deciduous incisors were analysed. All the specimens were broadly divided into two study groups as follows: Group 1: Specimens in which Tetric N-Ceram resin composite was used; and Group 2: Specimens in which Z250 Universal Restorative resin composite was used. Voco Remin Pro was remineralizing agent used in the study. Mean bond strength among the specimens of group 1 was found to be 23.96 MPa while mean bond strength of specimens of group 2 was found to be 13.41 MPa. Rizvi A et al established the microtensile bond strength of enamel following exposure to an aerated drink at various time intervals with/without application of remineralization

agent. In addition, degree of remineralization and demineralization of tooth enamel has been assessed using polarized light microscopy. Seventy extracted human incisors split into two halves were immersed in aerated beverage (cola drink) for 5 min and stored in saliva until the time of microtensile bond testing. Prepared specimens were divided randomly into two study groups; remineralizing group (n = 70): specimens were treated for remineralization using casein phosphopeptides and amorphous calcium phosphate (CPP-ACP) remineralization agent (Recaldent™; GC Europe) and control group (n = 70): no remineralization treatment; specimens were kept in artificial saliva. All specimens were tested for microtensile bond strength at regular intervals (1 h, 1 days, 2 days, 1 week, and 2 weeks) using a universal testing machine. The results statistically analyzed (P = 0.05) using two-way ANOVA test. Results showed statistically significant increase in bond strength in CPP-ACP tested group (P < 0.05) at all-time intervals. The bond strength of remineralizing group samples at 2 days (~13.64 megapascals [MPa]) is comparable to that of control group after 1 week (~12.44 MPa). CPP-ACP treatment of teeth exposed to an aerated drink provided significant increase in bond strength at a shorter interval compared to teeth exposed to saliva alone.¹⁰

In the present study, while comparing the mean bond strength in between the two study groups, it was observed that mean bond strength among the specimens of group 1 was higher in comparison to the mean bond strength of specimens of group 2, the results of which were found to be statistically significant. Abdelmegid FY et al assessed the effect of three remineralizing agents (Voco Remin Pro®, Uncle Harry's remineralization kit, Sunshine remineralization gel) on the shear bond strengths of two resin-composites (Tetric® N-Ceram and Filtek™ Z250 Universal Restorative) to enamel of primary molars. Ninety-six enamel specimens were prepared and randomly distributed to eight groups according to the control, remineralizing agents, and resin composite used. Shear bond strength was measured at a crosshead speed of 0.5 mm/min and the type of bond failure was recorded. The highest shear bond strength (Mean+SD) in MPa was for Tetric® N-Ceram/control [21.06+1.68] while the lowest was for Filtek™ Z250/Sunshine remineralization gel [11.98+1.46]. Tukey HSD Post Hoc Tests showed significant difference between Tetric® N-Ceram/control and all other groups (p=0.0001) except Filtek™ Z250/control. In addition, there was significant difference between Filtek™ Z250/control and all other groups (p=0.0001) except Tetric® N-Ceram/control and Tetric® N-Ceram/Uncle Harry's remineralization kit.

Mode of failure was cohesive (9.38%), adhesive (55.21%), and mixed (35.42%). The three tested remineralizing agents affect shear bond strength of the tested resin-composites to enamel of primary teeth. In general, shear bond strength values were acceptable. Mode of failure was mostly adhesive.¹¹

CONCLUSION

From the above results the authors conclude that Tetric N-Ceram exhibited maximum bond strength as compared to Z250 Universal Restorative. However; further studies are recommended.

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