

Shear Bond Strength of Chemically-Cured and Light-Cured Bulk Composites at Different Temperatures

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INTRODUCTION

Composite resin is a widely used restorative material, because of its esthetic properties, biocompatibility, and more importantly its low environmental impact. The properties of a restorative material require significant durability, strength and withstand degradation of the restoration when subjected to different factors in the oral cavity. The oral environment is a complex environment where a restorative material must be able to sustain against bacteria, changing pH, temperature, masticatory forces and saliva etc. The oral cavity is considered to be the harshest environment for a dental material in the body.^{1,2}

Shear bond testing is an established method to evaluate the bond strength between dental hard tissue and restorative materials.^{3,4}

Bulk-fill resin composites are currently the material of choice in direct restorations. They claim to possess lower post-gel shrinkage and higher reactivity to light polymerization than most conventional composites as a result of their increased translucent, improving the light penetration and the depth of cure.^{5,6}

Bioclear HeatSync Composite Warmer



METHODS

10 freshly extracted third molars were cross sectioned and embedded in resin to fabricate a specimen with a dimension of 2 cm in height and 2.5 cm in diameter. Group A: 10 specimens were used for shear bond strength measurement with the chemically-cured composite BulKEZ Plus (Zest Dental). Group B: 10 specimens were tested with light-cured composite Filtek Bulk One (3M) at room temperature. Group C: 10 specimens were tested with the light-cured composite Filtek Bulk One (3M) at 155 degrees Fahrenheit. The HeatSync Composite Warmer, mini from Bioclear was used to warm up the composites from group C. The same 10 samples were reused for all other groups. Shear bond testing was done with the Ultratester (Ultradent) at a crosshead speed of 1mm/min. Paired Student T-tests were performed to compare Group A with Group B, Group A with Group C, and Group B with Group C with a 95% confidence level.



Condensing Composite via Ultradent Shear Bond Method



Prepared Resin Sample with Composite Bonded to Dentin

SIGNIFICANCE

In this study, the light cured composite material performed superior to the chemically cured materials. The major difference between the two groups is that the chemically cured material is so low in viscosity that it cannot be condensed with a hand instrument. It depends on the flowability and surface tension of the material to adapt to the dentin surface, whereas light curing materials can be condensed to the surface which may increase the adhesion. Further studies should be done to evaluate the failure mode.

CONCLUSION

The null hypothesis was rejected because the chemically-cured composite scored significantly lower than both light-cured composite groups. No statistical difference was found between the light-cured groups.

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OBJECTIVE

The purpose of this study is to compare the shear bond strength of a chemically-cured bulk composite and a light-cured bulk composite. The chemically-cured bulk composite was delivered at room temperature. The light-cured composite was delivered at room temperature and at 155 degrees Fahrenheit. The null hypothesis is that there is no difference amongst the three groups.

Grinding of Resin Sample



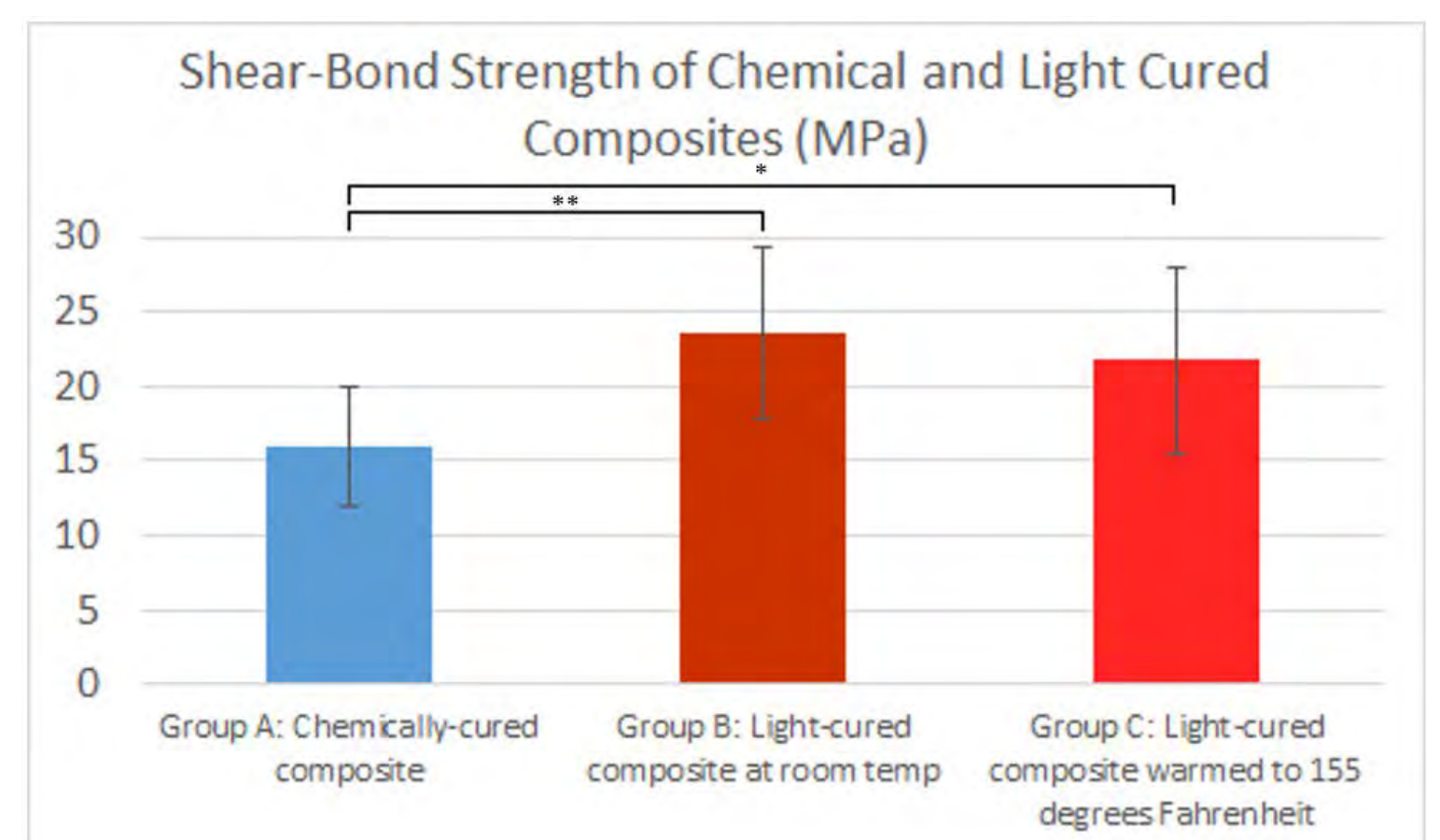
Ultratester (Ultradent)



Filtek Bulk One 3M (lower left), BulKEZ Plus Zest Dental (upper right), Scotchbond Universal Plus 3M (lower right)

RESULTS

The average results from the shear bond testing were 15.97 MPa for the chemically-cured composite (Group A), 23.07 MPa for the light-cured composite at room temperature (Group B), and 21.76 MPa for the light-cured composite warmed to 155 degrees Fahrenheit (Group C). Paired student T-tests between each group were done with a 95% confidence level. The p-value between Group A and B was 0.008, between Group A and C was 0.037, and between Group B and C was 0.266.



* p-value < 0.05 ** p-value < 0.01

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