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Research Article

EFFECT OF SUPER- OXIDE DISMUTASE, 10% SODIUM ASCORBATE AND 5% PRANTHOCYANIDINE AS ANTIOXIDANT ON SHEAR BOND STRENGTH OF COMPOSITE RESIN TO BLEACHED ENAMEL –AN IN VITRO STUDY

Ajay kute

MIDSR Dental College, Vishwanathpuram Ambajogai Road, Latur

A R T I C L E I N F O

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A B S T R A C T

Introduction-`Increased awareness about aesthetic has resulted in popularity of the more conservative techniques of tooth whitening with bleaching. However, an additional restorative treatment is often needed to attain desired aesthetics even after bleaching. An important consequence of use of carbamide peroxide as bleaching agent is decreased bond strength of composite resin when applied to enamel immediately after bleaching. The decreased bond strength is due to presence of oxygen ion that inhibits resin polymerisation. Antioxidant application is implemented to avoid delay in restoration. Hence effect of different antioxidant on enamel surface after bleaching should be evaluated for shear bond strength.

Material and Method - Fourty enamel slabs of size (3mm*3mm*2mm) will be prepared from maxillary central and lateral incisor. Each enamel specimen will be mounted in acrylic resin. All specimens will be randomly divided into four group, each containing 10 specimens. Group I (Control Group) will not receive any bleaching treatment and will kept in water at 370 C for 1 week.

All other group will be subjected to 35% carbamide peroxide bleaching and then treated with following group

Group II (Super-oxide dismutase)
Group III (10% Sodium ascorbate)
Group IV (5%Pranthocyanidine)

Then all specimen will be restored with composite and will be subjected to Universal testing machine to evaluate the shear bond strength at cross head speed of 1mm/min.

Result - Awaited

INTRODUCTION

With increasing interest in aesthetic dentistry, vital bleaching has become widespread. Previous studies that hydrogen peroxide (HP) and carbamide peroxide (cp) bleaching agent affect the bond strength of composite to acid etched enamel when bonding is performed immediately after the bleaching treatment.[1-3] Increased awareness and concern about esthetic has resulted in popularity of more conservative technique of tooth whitening with bleaching. Studies have shown that the shear bond strength of composite resin bonded to the tooth surface immediately after bleaching was significantly lower than that on unbleached tooth surface due to the prescence of residual oxygen layer.

Corresponding author:* **Ajay kute
MIDSR Dental College, Vishwanathpuram Ambajogai Road, Latur

Removal of this residual oxygen layer was found to increase the shear bond strength of composite resin to bleached enamel.The general approach of overcoming this post bleaching compromised bond strength was to delay the bonding procedure by a period varying from 24 to 3 week.

Several methods have been proposed to reversal the compromised bond strength following bleaching such as subjecting the bleached enamel to alcohol treatment before the restoration, removing the outermost layer of enamel and the use of organic solvent containing adhesive.[4] Other include exposing the bleached enamel specimen to water, saline solution, or artificial saliva[5].

Antioxidants like 10% sodium ascorbate have also been used to reverse the reduced bond strength of bleached enamel.[6-8] The interest in natural antioxidants of plant origin has greatly increased in recent years.[9] The aim of this in vitro study was to evaluate and compare the effects of OFsuper- oxide dismutase, 10% sodium ascorbate and 5%

pranthocyanidineon the bond strength of composite resins to bleached enamel. The hypothesis of this study was that the use of an antioxidant reversed the reduced bond strength of composite resins to bleached enamel.

MATERIALS AND METHODS

Preparation of Solutions

Ten grams of sodium ascorbate powder (SD Fine Chem Limited, Mumbai, India) was dissolved in 100ml of distilled water to make 10% sodium ascorbate solution, and 5% solutions of grape seed extract (pranthocyinidine) and Super-oxide dismutase were obtained from Infile and Cosmogen Private Limited, India respectively.

Specimen Preparation

Forty enamel slab of size (3mm*3mm*2mm) were prepared from maxillary central and lateral incisor, each enamel specimen were mounted in acrylic resin.Specimen were then randomly divided into four group of 10 specimen each. Ten specimens were randomly selected for the control group which did not receive any bleaching treatment, followed by composite restoration.All the other groups were subjected to bleaching treatment which were exposed to the bleaching agent containing 35% carbamide peroxide and applied over the prepared specimens using micro brushes.

In group 2 after bleaching, oxidation was carried out with help of super-oxide dismutase for 10 min, followed by composite restoration.

In group 3 after bleaching, oxidation was carried out with help of sodium ascorbate for 10 min, followed by composite restoration.

In group 4 after bleaching, oxidation was carried with help of pranthocyanidine for 10 min, followed by composite restoration.

All these specimen were then restored with composite and subjected to shear bond strength evaluation with help of universal testing machine at cross head speed of 1mm/min
Curing of composite material was done was done with the help of cylindrical ring manufractured according to the sample diameter to confine the composite restoration to specimen.

Shear Bond Strength Testing

Each specimen was placed in between the jigs of the universal testing machine and a pointed shearing rod was placed on the composite resin/tooth interface and was subjected to static loading at a rate of 1 mm/min until fracture occurred. The machine was interfaced with a computer through which the operation was controlled and shear bond strength was calculated.

Statistical Analysis

The values obtained were statistically analyzed using computer software Statistical Package for Social Sciences (SPSS) version 16.0 using one-way analysis of variance (ANOVA)

RESULTS

Highest mean shear bond strength value was observed in Group I, which was statistically significant, compared to other groups ($P < 0.001$). Group 2 show higher shear bond strength than group 3 and 4. Group 3 showed the least mean shear bond strength values compared to all other groups. But there is no significant difference between group 2, 3 and 4.

DISCUSSION

A significant decrease in the bond strength of composite resin has been reported after using carbamide peroxide when compared to unbleached enamel. Cavalli *et al* reported that various concentration of carbamide peroxide (i.e 10%, 16% and 20%) affect the bond strength of composite to enamel. Lower bond strength of bleached enamel and dentin are due to the imbalance in the redox potential caused by the balancing agent. Some authors postulate that the oxygen endures in the detinal structure after bleaching and can impede with the polymerization of adhesive monomers.

Factors such as loss of calcium decrease in micro hardness and alteration in the organic part of the substract might be responsible for a decrease in enamel bond strength.

Hans *et al* evaluated the effect of antioxidant after bleaching and its influence on the microleakage of composite restoration and concluded that catalase was more effective in reducing microleakage associated with reduced bond strength.

In this study, we used various antioxidants for the evaluation of reversal of bond strength of enamel. 10% sodium ascorbate, 5% pranthocyanidine and super oxide dismutase are natural antioxidants which can deactivate free radicals.

Sodium ascorbate is cost effective water soluble and commonly available antioxidant material. Many authors have evaluated its effect on bleached teeth when composite resins have been used as bonding adhesive.

Lai *et al* asserted that when an antioxidant such as Sodium ascorbate was applied for 3 hr to enamel after bleaching with carbamide peroxide, the composite shear bond strength was improved.

Kunt *et al* and Lai *et al* suggest that Sodium ascorbate allows free radical polymerization of adhesive resin to proceed without premature termination by restoring the altered redox potential of the oxidized bonding substrate and hence reverse the compromised bonding.

In 2011, lima *et al* showed that even short duration of 10% Sodium ascorbate application (i.e 1 min) could still obviate the detrimental effect of bleaching on shear bond strength.

According to suneetha *et al* in 2014, 10% Sodium ascorbate solution was effective in the reversal of shear bond strength immediately after bleaching.

Subramonian *et al* in 2015 showed that application of 10% Sodium ascorbate immediately after bleaching could neutralize the residual oxygen and could reverse the

reduced bond strength , but scanning electron microscope image have demonstrate that application of ascorbic and resulted in super etching of the already bleached enamal surface.

SODs are a class of metal co- factored enzymes discovered by Irwin Fridovich and Joe McCord that detoxify these free radicals by catalysing the dismutation of superoxide into oxygen and hydrogen peroxide.

SODs reduce and reverts super-oxide induced cell damage in the body. Free radical cause wrinkle and precancerous cell change in the body which is neutralised by the antioxidant and anti inflammatory action of SOD SOD is a biological enzyme which acts at the very starting point of the free radical generation that is superoxide. At this level the SOD nullifies the superoxide ion by converting it into hydrogen peroxide

CONCLUSION

Antioxidants are gaining importance now a days due to increase in requirement for immediate esthetic restoration, and from this study we can conclued that antioxidant like super oxide dismutase as fullfied all the requirements of an ideal antioxidant when compare to sodium ascorbate and pranthocyinidine. In the limitation of this study newer antioxidant should be compared and studied with these antioxidant.

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