

## Original Research

### Assess the effect of antioxidants on the bond strength of composite resin to bleached enamel

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#### ABSTRACT:

**Background:** The application of antioxidant agents after bleaching has been recommended as a way to reduce the waiting period between bleaching and restorative procedure by eliminating the reactive oxygen from the dental substrate. The present study was conducted to assess the effect of antioxidants on the bond strength of composite resin to bleached enamel. **Materials & Methods:** The present study was conducted on 30 freshly extracted maxillary premolars. Each crown was sectioned with carbide disc longitudinally and a total of sixty enamel specimens were obtained. The specimens were divided into 4 groups. Group I (15) was control group (No bleaching). Group IIa (15) specimens were bleached with 15% carbamide peroxide, group IIb (15) specimens were bleached with 15% carbamide peroxide followed by application of 10% sodium ascorbate gel, group IIc (15) were bleached with 15% carbamide peroxide followed by application of 5% PA agent. The shear bond strength assessment was done using universal testing machine. **Results:** The mean bond strength in group I was 24.6 MPa, in group II was 15.2 MPa, in group II b was 27.3 MPa and in group II c was 32.1 MPa. The difference was significant ( $P < 0.05$ ). **Conclusion:** Authors found that the use of antioxidant before bonding procedures on bleached enamel completely neutralizes the deleterious effects of bleaching and increases the bond strength significantly.

**Key words:** Bleaching, bond strength, universal testing machine

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#### INTRODUCTION

The presence of an un-aesthetic discolored tooth is of great concern to patients and has a profound effect on the patient's confidence and oral health, which in turn can significantly contribute to the total well-being of an individual.<sup>1</sup> Tooth discoloration is caused by intrinsic

and extrinsic factors, which can be treated by bleaching, enamel microabrasion, porcelain veneers, crowns.<sup>2</sup>

In an era of minimum intervention dentistry, increasing numbers of patients do not want their teeth "cut down" for crowns and are electing conservative approach such as veneers and bleaching which preserves as much of the natural tooth as possible. Tooth bleaching can be

performed at home and in the dental office.<sup>3</sup> Among bleaching agents, carbamide peroxide bleaching is a safe, well accepted, and an increasingly popular procedure. These bleaching agents despite having many advantages also have some disadvantages.<sup>4</sup> One of the most important complications of the use of bleaching agents is decreased composite resin bond strength to enamel immediately after bleaching procedure. It has also been reported that the weakening of bond occurred both superficially and internally. This could be attributed to the presence of residual peroxide, which interferes with the resin tag formation and inhibits the resin polymerization.<sup>5</sup>

The use of antioxidant surface treatment immediately after the bleaching procedure and delaying the restorative bonding for at least two weeks has found minimal effect. So the application of antioxidant agents after bleaching has been recommended as a way to reduce the waiting period between bleaching and restorative procedure by eliminating the reactive oxygen from the dental substrate.<sup>6</sup> The present study was conducted to assess the effect of antioxidants on the bond strength of composite resin to bleached enamel.

**MATERIALS & METHODS**

The present study was conducted in the department of Endodontics. It consisted of 30 freshly extracted maxillary premolars due to orthodontic purposes.

Ethical approval was obtained from institute prior to the study.

All the teeth were stored in isotonic saline. Each crown was sectioned with carbide disc longitudinally and a total of sixty enamel specimens were obtained. The specimens were divided into 4 groups. Group I (15) was control group (No bleaching). Group IIa (15) specimens were bleached with 15% carbamide peroxide, group IIb (15) specimens were bleached with 15% carbamide peroxide followed by application of 10% sodium ascorbate gel, group IIc (15) were bleached with 15% carbamide peroxide followed by application of 5% PA agent.

Bleaching procedure was carried for 8 hours a day for 5 days. Immediately after bleaching procedure, 10% sodium ascorbate gel was applied on group 2b specimen and 5% PA agent was applied on the group 2c specimens using a brush. After 10 min, it was rinsed and dried. Acid etching procedure was performed with 35% phosphoric acid for 15 seconds. A total adhesive was applied to all specimens. The plastic tube was filled with composite and light cured for 40 seconds then tubes were removed. The shear bond strength assessment was done using Instron universal testing machine using formula ie. bond strength = Force in kilogram needed to debond the composite cylinder × 9.8/total surface area. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

**RESULTS**

**Table I Distribution of specimens**

Group I	Group II a	Group II b	Group II c
Control	15% carbamide peroxide	15% carbamide peroxide & 10% sodium ascorbate gel	15% carbamide peroxide & 5% PA agent.
15	15	15	15

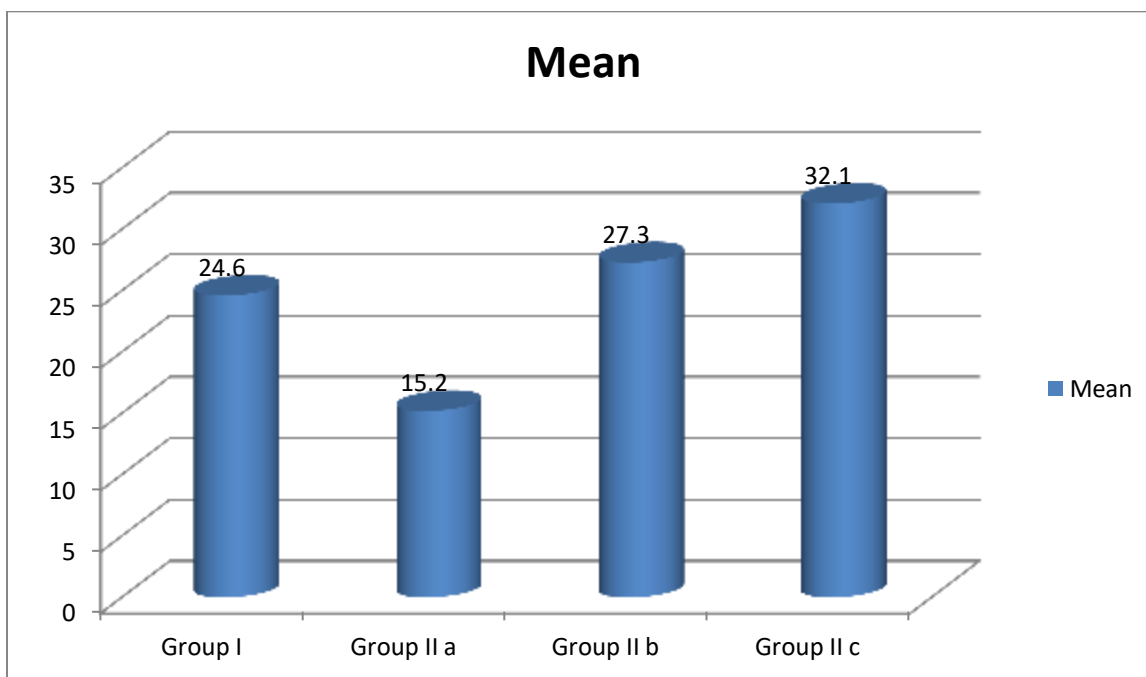
Table I shows distribution of specimens in various groups.

**Table II Comparison of bond strength**

Groups	Mean	P value
Group I	24.6	0.01
Group II a	15.2	
Group II b	27.3	
Group II c	32.1	

Table II, graph I shows that mean bond strength in group I was 24.6 MPa, in group II a was 15.2 MPa, in group II b was 27.3 MPa and in group II c was 32.1 MPa. The difference was significant (P< 0.05).

**Graph I Comparison of bond strength**



**DISCUSSION**

There are three fundamental approaches for bleaching of vital teeth; in-office or power bleaching; at home or dentist supervised night-guard bleaching; and bleaching with over the-counter (OTC) products.<sup>7</sup> In-office bleaching utilizes a high concentration of tooth-whitening gels (25-40% HP) and different types of curing lights like Halogen curing light; Plasma arc lamps; Xe-halogen light; Diode lasers; or metal halides to activate the bleaching gel. Post-operative sensitivity is one of the most common complications of bleaching, which accounts for 62.2%. Clinical researches reported a prevalence of 18-78% of sensitivity either with at-home tray delivery or in office procedures.<sup>8</sup>

Complications of bleaching may vary from postoperative sensitivity to pulpal irritation to tooth structure alterations or microleakage of existing restorations. Another important complication following bleaching procedure is decreased bond strength of composite resin to enamel. This decreased bond strength is due to the presence of oxygen ions which interfere with resin polymerization. This decrease in bond strength of composite resin to enamel can be improved by delaying its placement after 1-3 weeks following the bleaching procedure. Several other techniques have also been proposed to remove the oxygen radical from the surface enamel.<sup>9</sup> The present study was conducted to assess the effect of antioxidants on the bond strength of composite resin to bleached enamel.

In our study, the specimens were divided into 4 groups. Group I (15) was control group (No bleaching). Group II a specimens were bleached with 15% carbamide peroxide, group IIb specimens were bleached with 15% carbamide peroxide followed by application of 10% sodium ascorbate gel, group II c were bleached with 15% carbamide peroxide followed by application of 5% PA agent. Chaitanya et al<sup>10</sup> assessed the bond strength of composite to bleached enamel using the following antioxidants Sodium Ascorbate, Proanthocyanidin, Superoxide dismutase, Quercetin. The control group and the experimental group Quercetin showed the highest micro-tensile bond strength, and group 2 i.e, immediate bonding after bleaching group showed the lowest micro-tensile bond strength.

Arumugam et al<sup>11</sup> compared the effect of 10% sodium ascorbate, 6.5% proanthocyanidin, and 5% lycopene on the bond strength of composite resin to bleached enamel.

Labial enamel surfaces of 100 extracted human maxillary central incisors were used in this study. Twenty teeth served as group I (control) and received no bleaching treatment. The remaining 80 teeth were randomly divided into four groups of 20 teeth each, based on the antioxidant used as follows: group II- bleaching with 35% carbamide peroxide gel for 30 min without the use of an antioxidant, group III- bleaching followed by use of 10% sodium ascorbate solution, group IV- bleaching followed by use of 6.5% proanthocyanidin, and group V- bleaching followed by use of 5% lycopene. These groups were further

subdivided into two subgroups of 10 teeth each, based on whether composite buildup was done immediately (subgroup A) or after a delay of 2 weeks (subgroup B) post bleaching. There was significantly higher shear bond strength values in teeth treated with control group prior to bonding, followed by sodium ascorbate group. Manoharan et al<sup>12</sup> included four groups. Group 1 was control; group 2a was bleaching with 15% carbamide peroxide gel, group 2b was bleaching, followed by application of 10% sodium ascorbate gel and group 2c was bleaching, followed by application of 5% proanthocyanidin agent. There was significantly higher shear bond strength values were observed in Group 2c and 2b as compared with Group 1 and 2a. Among the antioxidants, Group 2c showed significantly higher shear bond strength values than group 2b. The use of antioxidant before bonding procedures on bleached enamel completely neutralizes the deleterious effects of bleaching and increases the bond strength significantly. Clinicians should be aware of the outcome of the bleaching treatment and the interactions with further dental treatments, especially additional adhesive esthetic interventions such as composite bonding, or laminate veneers.

## CONCLUSION

Authors found that the use of antioxidant before bonding procedures on bleached enamel completely neutralizes the deleterious effects of bleaching and increases the bond strength significantly.

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