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ORIGINAL RESEARCH

Assessment of the micro-tensile bond strength of resin to bleached enamel using different antioxidants- An in vitro study

Sasmita Dalai¹, Anmol Bagaria², Niharika Naithani³, Subham Kumari⁴, Anjali Sharma⁵, Arif Siddiqui⁶

¹PG 1st year, Department of Public Health Dentistry, Teerthanker Mahaveer Dental College and Research Centre, Moradabad, Uttar Pradesh;

²BDS (Bharati Vidyapeeth Deemed to be University's Dental College & Hospital, Navi Mumbai), Private practitioner, Mumbai, Maharashtra;

³MDS Conservative dentistry and Endodontist, Private practitioner Dehradun;

⁴BDS (Buddha Institute of Dental Sciences and Hospital, Patna), Fellow in Academy of General Education, Manipal, Karnataka;

⁵Private Practitioner, Patna;

⁶PG 1st year Department of Conservative Dentistry and Endodontics, Teerthankar Mahaveer Dental College and Research Centre, Moradabad, Uttar Pradesh;

⁷PG 1st year, Department of Periodontology and Implantology, Teerthankar Mahaveer Dental College and Research Centre, Moradabad, Uttar Pradesh

ABSTRACT:

Background: The present study was conducted to assess the micro-tensile bond strength of resin to bleached enamel using different antioxidants. **Materials & Methods:** This invitro study was conducted on 50 recently extracted permanent premolars. All teeth were sectioned from the root using rotary saw under water irrigation. All specimens were divided into 5 groups of 10 each. Group I was control, in group II, teeth were bleached and restored immediately, in group III samples were bleached and 10% sodium Ascorbate (SA), in group IV samples were bleached and 5% Proanthocyanidin (PA) and in group V samples were bleached and super oxide dismutase (SOD). Micro-tensile bond strength was tested in all samples. **Results:** The mean microtensile bond strength in group I was 16.2 MPa, in group II was 5.4 MPa, in group III was 15.6, in group IV was 12.8 and in group V was 6.2 MPa. The difference was significant ($P < 0.05$). **Conclusion:** Authors found that sodium ascorbate (SA) had tensile strength equal to control group.

Key words: Proanthocyanidin, sodium ascorbate, Tensile strength,

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Corresponding author: Dr. Sasmita Dalai, PG 1st year, Department of Public Health Dentistry, Teerthanker Mahaveer Dental College and Research Centre, Moradabad, Uttar Pradesh, India

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INTRODUCTION

The occurrence of discolored tooth is of great anxiety to patients and has a deep effect on the patient's confidence and oral health, which in turn can

significantly contribute to the total well-being of an individual.¹ Tooth discoloration is caused by intrinsic and extrinsic factors, which can be treated by bleaching, enamel microabrasion, porcelain veneers, crowns.²

Pigmentation of dental structures is one of the most common clinical issues related to aesthetics in dentistry. Dental bleaching could be a conservative and simple option to reverse this condition. Moreover, after the bleaching procedure, many situations call for adhesive restorations, such as remodeling the anatomical form, closure of diastema or replacing anterior restorations.³ After bleaching, the residual oxygen remains among the enamel prisms and the polymerization of the resin monomers can be inhibited by its presence, damaging the marginal sealing, promoting an early microleakage process and reducing the bond strength of the restorations.⁴

Several studies have found no significant difference between the use of antioxidant surface treatment immediately after the bleaching procedure and delaying the restorative bonding for at least two weeks.⁵ 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. Enzymatic agents such as Super Oxide dismutase and non-enzymatic agents such as Sodium Ascorbate (SA), Flavonoids, Lycopene, and Vitamin E have antioxidant properties.⁶ The present study was conducted to assess the micro-tensile bond strength of resin to bleached enamel using different antioxidants.

MATERIALS & METHODS

This invitro study was conducted in the department of Conservative dentistry. It consisted of 50 recently extracted permanent premolars due to orthodontic treatment. The study was approved from institutional ethical committee.

All teeth were sectioned from the root using rotary saw under water irrigation. The crown specimens were embedded in self-cure acrylic resin with the labial surfaces parallel to the horizontal plane. The buccal surfaces were flattened with silicon carbide sandpaper with decreasing granulations under abundant irrigation with water for 10 seconds with each sand paper and for 60 seconds with the 600 grit sandpaper, to obtain a flat surface and maintain approximately 1.5 mm of enamel remnant. All specimens were divided into 5 groups of 10 each. Group I was control, in group II, teeth were bleached and restored immediately, in group III samples were bleached and 10% sodium Ascorbate (SA), in group IV samples were bleached and 5% Proanthocyanidin (PA) and in group V samples were bleached and super oxide dismutase (SOD). Micro-tensile bond strength was tested in all samples. Results were tabulated and subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of samples

Groups	Group I	Group II	Group III	Group IV	Group V
Procedure	Control	Bleached and restored immediately	10% sodium Ascorbate (SA)	5% Proanthocyanidin (PA)	Super oxide dismutase (SOD)
Number	10	10	10	10	10

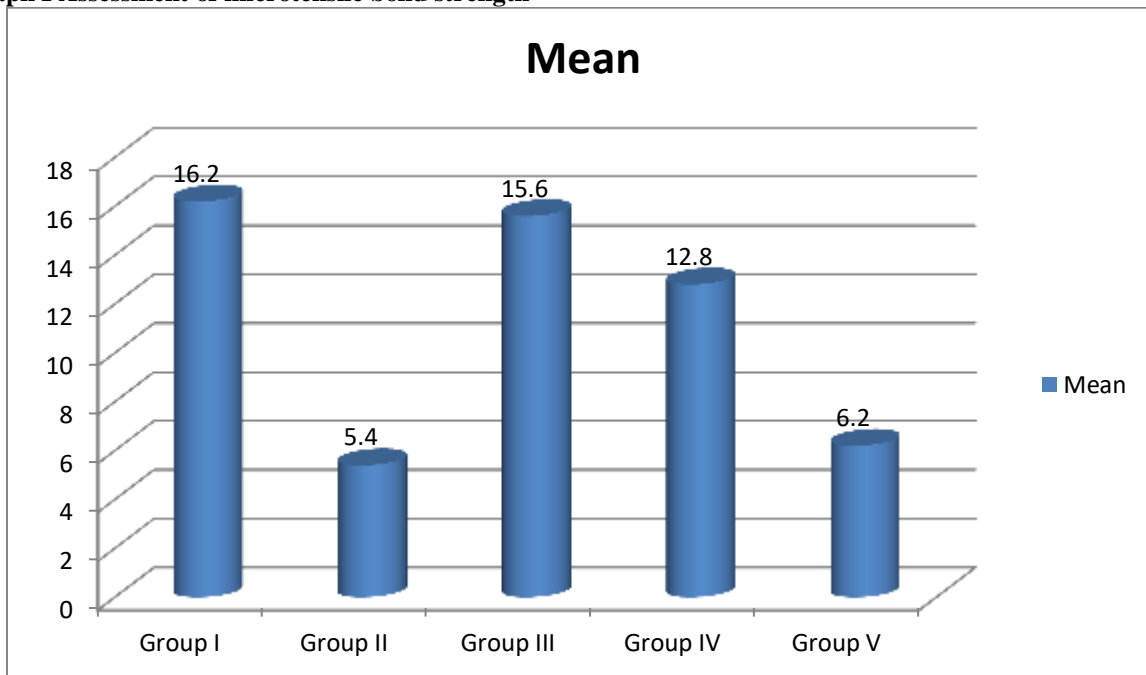
Table II shows distribution of samples according to the procedure used.

Table II Assessment of microtensile bond strength

Groups	Mean	P value
Group I	16.2	0.001
Group II	5.4	
Group III	15.6	
Group IV	12.8	
Group V	6.2	

Table II, graph I shows that microtensile bond strength in group I was 16.2 MPa, in group II was 5.4 MPa, in group III was 15.6, in group IV was 12.8 and in group V was 6.2 MPa. The difference was significant (P< 0.05).

Graph I Assessment of microtensile bond strength



DISCUSSION

Discolored teeth lead to poor esthetics. It has been proposed that HP penetrates enamel and dentin to reach the pulp cavity, and the residual oxygen from the bleaching agent inhibits resin polymerization. So, to prevent the deleterious effects of peroxide on the resin, a waiting period of 1-3 weeks is recommended. However, due to the immediate aesthetic requirements of the patients, other methods of reversing the reduced bond strength of enamel after bleaching becomes important.⁷ The present study was conducted to assess the micro-tensile bond strength of resin to bleached enamel using different antioxidants.

In present study, group I was control, in group II, teeth were bleached and restored immediately, in group III samples were bleached and 10% sodium Ascorbate (SA), in group IV samples were bleached and 5% Proanthocyanidin (PA) and in group V samples were bleached and super oxide dismutase (SOD). Each group had 10 samples. Alencar et al⁸ evaluated the effect of sodium bicarbonate and sodium ascorbate on the microtensile bond strength of an etch-and-rinse system to bleached bovine enamel. 60 bovine enamel blocks randomly allocated into 5 groups: G1 (negative control): without treatment; G2 (positive control): bleached with 35% hydrogen peroxide (HP); G3: bleached and stored for 7 days in artificial saliva before restorative procedures; G4: bleached and treated with 10% sodium bicarbonate solution for 5 min; G5: bleached and treated with 10% sodium ascorbate hydrogel for 15 min. HP gel was applied twice and the adhesive restorations were performed. The scanning

electron microscopy showed that the enamel surface of G1 appeared less porous compared to the enamel surface of G2 (specimens bleached with 35% hydrogen peroxide for 40 min and etched with 37% phosphoric acid for 30 s). G2 presented a highly porous and rough surface.

We found that microtensile bond strength in group I was 16.2 MPa, in group II was 5.4 MPa, in group III was 15.6, in group IV was 12.8 and in group V was 6.2 MPa. The difference was significant (P< 0.05). Chaitanya et al⁹ found that the mean micro-tensile bond strength values are highest for group-1 (16.31 MPa) and least for group-2 (5.03MPa). The mean values are in descending order group1 followed by group-7, group-4 and group-3, group-5, group-6, group-2. There was no statistical difference in micro-tensile bond strengths between group-1, group-3, group-4, group-5 and group-7. There was a statistical significant difference between group-1, group-2 and group-6.

Sodium Ascorbate is the most commonly used antioxidant which became the standard of care. αTocopherol is the most active component of vitamin E Complex. Quercetin is one of the flavonoids with antioxidant property. It is available in fruits and vegetables.¹⁰

Various techniques have been recommended to counteract the impaired resin-adhesion problem. Commonly recommended solution is delaying the restorative treatment by 1-3 weeks to allow the degradation of residual oxygen.¹¹ According to some authors, the recommended waiting period for restorative procedures on enamel after bleaching with 10% CP is

24 hours. Some authors suggested a waiting period of one week. Many authors claimed that a period of 24 hours is not enough to re-establish the bond strength to enamel for higher concentrations like 9.5, 25, 30, 35 and 38% HP and at least 1-3 weeks is necessary.¹²

CONCLUSION

Authors found that sodium Ascorbate (SA) had tensile strength equal to control group.

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