

The effect of bleaching on shear bond strength of resin bonded bridges

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ABSTRACT

Sixty intact upper central and lateral incisors were used in this study the teeth were divided into four groups, the first group was the control group the other groups were bleached with (10%) carbamide peroxide (Opalescence 10%) for two weeks the bleaching material was changed every (8) hours. Sixty discs shaped samples were cast from nickle chromium CB Blando 72 alloy the diameter of each sample was (5) mm and the thickness was (1) mm, the bonding surfaces were sandblasted. The discs were bonded to the teeth in the first and second groups one day after bleaching, the third group was bonded one week after bleaching while the fourth group was bonded two weeks after bleaching. The bonding material used for all groups was Super Bond Crown and Bridge Material. The shear bond strength of the samples was tested. The statistical analysis showed that the second group has the lowest bond strength while the fourth group showed the highest bond strength. This indicates that bleaching affects the bond strength of resin bonded bridges fabricated from CB Blando 72 nickel chromium alloy so that bridges must be fabricated at least two weeks after bleaching.

Key words: Bleaching, Resin bonded bridges, Acid etching retainer

الخلاصة

جرت الدراسة على (٦٠) نموذج من أسنان أمامية علوية مقلوعة، وقد تم تقسيم النماذج إلى أربعة مجاميع كل مجموعة تحتوي على (١٥) نموذج: المجموعة الأولى تركت بدون قصر و باقي المجموعات تم قصرها بمادة قاصرة تحتوي على (١٠%) من مادة كاربيد بروكسايد لمدة أسبوعين و تم تبديل المحلول القاصر كل (٨) ساعات. تم صب أقراص من مادة نيكل

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لمدة أسبوعين و تم تبديل المحلول القاصر كل (٨) ساعات . تم صب أقراص من مادة نيكول كروميوم بقطر (٥) ملم وبصمك (١) ملم . بعد ذلك لصقت الأقراص على الأسنان من المجموعة الأولى و الثانية بعد يوم واحد من الانتهاء من عملية القصر، و المجموعة الثالثة بعد أسبوع واحد أما المجموعة الرابعة فتمت عملية اللصق بعد فترة أسبوعين . بعد ذلك تمت عملية فحص النماذج وعملية التحليل الإحصائي و أظهرت النتائج بان عملية القصر لا تؤثر على قوة الالتصاق إذا تمت بعد فترة أسبوعين من الانتهاء من عملية القصر .

INTRODUCTION

Various bleaching materials are currently used to bleach teeth ⁽¹⁾. The current at home bleaching materials uses carbamide peroxide diluted to 10% concentration ⁽²⁾. Such dilutions provide hydrogen peroxide concentrations equivalent to 3.0% to 3.5 % ⁽³⁾. This appears to be safe, effective concentration at which the bleaching of enamel to be achieved. Since carbamide peroxide decomposes into hydrogen peroxide and urea ⁽⁴⁾. It was suggested that prolonged exposure to hydrogen peroxide resulted in precipitate formation on the enamel surface ⁽⁵⁾. Other studies suggested that the elimination of stains is dependent on the dissolution of the superficial enamel layer similar to that achieved by the use of (37%) phosphoric acid etch technique ^(5,6,7). The use of carbamide peroxide is said to result in an increase in the pH attributed to the presence of ammonia and carbon dioxide both of which are the byproducts of urea breakdown ^(4,8,9). However, recent studies concluded that carbamide peroxide did not cause any significant change in enamel surface structure or result in enamel etching ^(10,11,12). It has been suggested that the changes in the pH does not reach the enamel demineralization standard pH of (5.2) to (5.8) ^(3,13). And therefore dose not result in significant enamel demineralization ⁽⁶⁾.

Dentists are obviously interested in determining whether any of the changes in the enamel surface also result in alteration of its adhesive characteristics to restorative bonding materials. In a study designed to evaluate the effects of carbamide peroxide bleaching material on shear bond strength of restorative composite resins, it was concluded that the adhesive bond strength to enamel was significantly reduced ⁽¹⁴⁾. Other study showed that the use of (10%) carbamide peroxide did not result in significant change in shear bond strength of orthodontic bracket ⁽¹⁵⁾. Since some patients who are interested in resin bonded bridges might have also had their teeth bleached or might be interested in the procedure. It seems important to determine whether such a procedure would significantly influence the

bonding strength of resin bonded bridges to the tooth surface. The purpose of this study is to evaluate the effect of bleaching on the shear bond strength of resin bonded bridges.

MATERIALS AND METHODS

Sixty extracted human central and lateral incisors, all in good condition, were collected. The teeth cleaned and then polished with none fluoridated pumice and rubber prophylactic cups. The teeth were placed in plastic rings using acrylic resin (Q.D manufacturing Co., Ltd., England) so that the labial surface is perpendicular to the top of the mold as shown in figure (1). The teeth were randomly assigned to four groups of (15) each. The first group was the control group without bleaching, the other three groups were bleached with carbamide peroxide (10%) (Opalescence UltraDent Products Inc.) for two weeks, the bleaching material was changed every (8) hours, the viscous characteristics of this material allowed it to be placed directly on the enamel with out the need of tray. After finishing of the bleaching all samples were stored in distilled water.

Sixty disc shaped samples were prepared from pink wax (Q.D manufacturing Co., Ltd., England) the diameter of each sample was (5) mm and the thickness was (1) mm the samples were cast in a nickel chromium (CB Blando 72) alloy (Hatakeyama Dental MFG Co., LTD., Japan) then the samples were cleaned and polished, the bonding surface was sandblasted using (50) μ m aluminum oxide.

One day after finishing of the bleaching the teeth in the first and second groups were thoroughly rinsed dried with air conditioned with (37%) phosphoric acid solution for (60) seconds and followed by immediate rinsing for (30) seconds. Air was applied for (20) seconds to dry the teeth. Super Bond Crown and Bridge material (Sun Medical Co., Ltd., Mōriyama, Japan) was used for bonding, the material was mixed according to the manufacturers directions and applied on the disc surface and the disc was bonded to the tooth surface as shown in figure (2). The third group was bonded one week after bleaching; the fourth group was bonded two weeks after bleaching by the same procedure. The teeth were stored in distilled water for (48) hours. One of the samples in the second group showed failure in bonding so this sample was excluded. Shear bond strength were determined using Electric Unconfined Compressed Apparatus (soil Test Co., USA), at a cross head speed of 0.5 cm /min .The force of failure was recorded for each sample and appropriate statistical analysis were completed after collection of data.

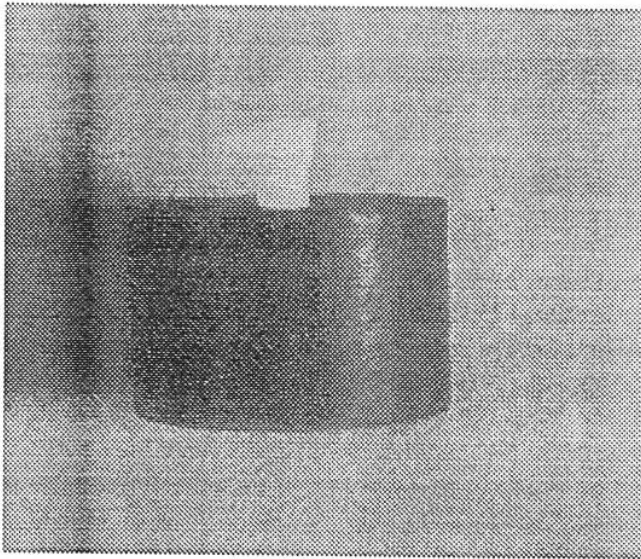


Figure (1): The tooth mounted on the plastic ring

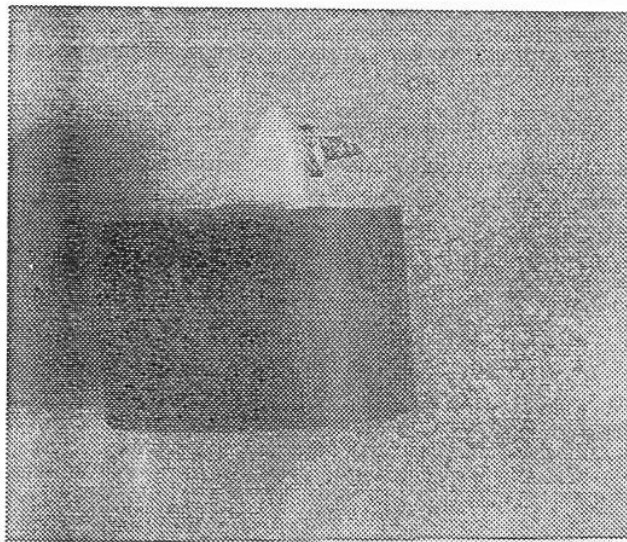


Figure (2): The disc bonded to the tooth

RESULTS

Figure (3) shows the four bleaching groups and their shear strength measured in Mpa. The shear bond strength was tested statistically using analysis of variance and the Duncan Multiple Range test (table 1). No significant differences were present between the first and the fourth groups. There is a significant difference between those two groups and the second and third groups. The second group showed a dramatic decrease in bond strength. There is an increase in the bond strength of the third group compared to the second group but did not reach that of the control group.

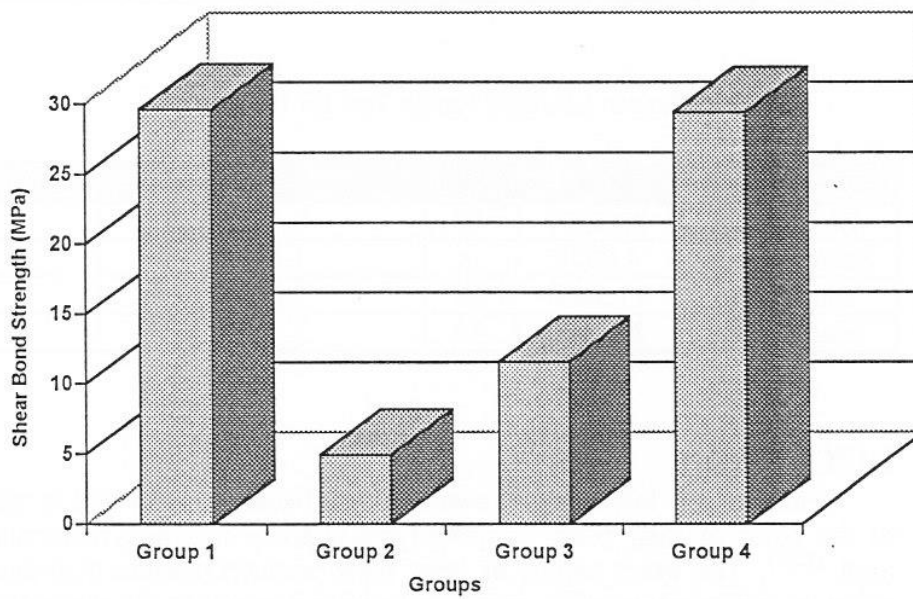


Figure (3): Shear bond strength of the tested groups

Table (1): Shear bond strength ANOVA
and Duncan Multiple Range Tests for the four groups

ANOVA Summary Table

Source	Sum of Squares	DF	Mean Square	F	Sig.
Between groups	6930.934	3	2310.311	254.167	.000
Within Groups	499.935	55	9.090		
Total	7430.868	58			

Duncan Multiple Range Test for the groups

Source	Mean	No	Standard Deviation	Groups
First group	29.6267	15	3.5654	A
Second group	4.9071	14	1.4419	B
Third group	11.5400	15	2.6653	C
Fourth group	29.4000	15	3.7367	A

DISCUSSION

Patients are increasingly aware of their facial esthetics as it is related to the color of their teeth. Various types of home bleaching materials are used^(1,3,7). The exact nature of how these products produce their desired effect is still controversial, particularly when it comes to the change in the morphology and structure of the enamel surface^(5,11,16,17,18). Bishara *et al*⁽¹⁵⁾ showed that bleaching with (10%) carbamide peroxide did not result in significant changes in the shear bond of orthodontic brackets⁽¹⁵⁾. In a study designed to evaluate the effects of carbamide peroxide bleaching agents on shear bond strengths of restorative composite resins, it was concluded that the adhesive bond strength to enamel was significantly reduced after bleaching⁽¹⁴⁾.

From the present study, it can be concluded that bleaching of teeth with (10%) carbamide peroxide products significantly affects the shear bond strength of resin bonded bridges fabricated from CB Blando 72 nickel chromium alloy.

CONCLUSION

The main objectives of this study was to determine whether bleaching affects the shear bond strength of resin bonded bridges or not the following results were obtained:

- 1- The shear bond strength of the samples bonded one day after finishing of bleaching was very low.
- 2- The group bonded one week after finishing of bleaching showed an increase in the shear bond strength, but did not reach that of the unbleached control group.
- 3- After two weeks there is no effect of bleaching on the shear bond strength when compared with that of the control group.

CLINICAL IMPLICATIONS

This study showed a decrease in the shear bond strength after bleaching and this effect diminishes after two weeks so care must be taken to fabricate resin bonded bridges at least two weeks after finishing of the bleaching in order to avoid failures in such types of prosthesis.

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