



The Effects of Acetic Acid and Chlorhexidine Gluconate as a Cavity Cleanser on the Shear Bond Strength of Compomer Restorations

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Abstract

Bonding of restorative materials to tooth structure has become one of the prime objectives of modern dentistry. The purpose of this in vitro study was to evaluate and compare the shear bond strength of compomer material to dentin washed with three cleanser agent. Thirty freshly extracted adult human maxillary first, premolars teeth were utilized in this study. Each tooth was sectioned horizontally exposing the dentin surface. According to the type of cleanser agent used to wash the dentin surface; the teeth were divided into three groups of ten teeth each: Group I chlorhexidine cleanser with compomer; Group II acetic acid with compomer; and Group III distal water with compomer. The measurement for evaluation the shear bond strength of compomer to dentin by using Zwick universal testing machine. The results showed that higher significant difference between group I and group III also between group II and group III; however, there is no significant difference between group I and group II. This present in vitro study concludes that the shear bond strength of compomer material to dentin can be enhanced by washing the exposed dentin with cleanser agents chlorhexidine and acetic acid instead of distal water.

Keywords: shear bond strength, cleanser, compomer.

Introduction

Effective bonding to tooth hard tissue is an absolute necessity for clinical success using tooth colored materials, like compomer (polyacid modified composite resin); good marginal adaptation prevents microleakage, recurrent caries and pulpal irritations.⁽¹⁾ Cavity cleanser is a 2% chlorhexidine digluconate aqueous solution intended for cleansing, moistening and disinfecting cavity preparation, it is recommended for use upon completion of tooth preparation or etching, prior to sealing dentinal tubules. Chlorhexidine (CHX) has been used successfully for many

years in the oral cavity as an antimicrobial agent^(2,3). It has been shown that thorough cleansing of cavity preparation to remove debris and bacteria decrease post operative sensitivity, when inadequate caries removal or microbial allows bacteria to colonize or proliferate in the smear layer of the cavity preparation, bacterial toxins and degradation products can mediate pulpal injury. The use of an antimicrobial agent prior to placing restorations may help eliminate patient discomfort associated with this microbial activity.⁽⁴⁾ Chlorhexidine has been shown to be a

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safe and effective antimicrobial agent against bacteria in the oral environment. CHX is actually absorbed by the dentin, producing a prolonged antimicrobial effect in low concentrations⁽⁵⁾. Acetic acid is also considered as antimicrobial agent act as a cavity cleanser Acetic acid is being examined to be a possible intracanal medicament as a cleansing material and has been used in low concentrations in treating certain diseases without any serious cytotoxic effects⁽⁶⁾. Thus a study was conducted to investigate the effects of Chlorhexidine (CHX) and acetic acid on the shear bond strength of compomer material.

Materials and Methods

Thirty sound adult human upper first premolar teeth recently extracted for orthodontic purpose were selected. Each tooth was sectioned horizontally at the junction of the occlusal and middle thirds exposing dentine and it was wet polished with 600 grit silicon carbide abrasive paper. According to the type of cleanser agent used to wash the exposed dentine, the experimental teeth were divided into three groups often teeth each as shown in table 1. Group (I); chlorhexidine cleanser (Ibn Hyan company, Syria) with compomer material (dyract, dentsply, Germany), Group (II); acetic acid cleanser (Fluka chemical, England) with compomer, Group (III); distal water cleanser with compomer. Then the compomer material were applied on the exposed dentine at surface area with diameter of 4mm by using clear tube with 2mm in height and 4mm in diameter. Compomer mixed according to manufacturers instructions. The shear bond strengths of compomer to exposed dentine were determined by using a Zwick universal testing machine.

Results

The present in vitro study aimed to evaluate and compare the shear bond strength of compomer material to dentine, the results are tabulated in table (II) and shown in Figure (I). (ANOVA) test were used for statistical analysis of data and comparison of shear bond strength of compomer to dentin between three groups. The shear bond strength of compomer to dentin washed with chlorhexidine ranged from 12.72 mpa to 17.55 mpa with a mean of 15.68 mpa, while for acetic acid cleanser agent ranged from 9.89 mpa to 13.94 mpa with a mean of 11.59 mpa, and for distal water cleanser ranged from 5.94 mpa to 8.57 mpa with a mean of 7.51 mpa. Comparison between groups indicates that group I a significantly higher shear bond strength values than group III, also group II shows significantly higher shear bond strength than group III; however, no significant difference were noted between group I and group II.

Discussion

The integrity of the bond between dentin and resin adhesive system has important implications for clinical dentistry in improving the success of composite resin restoration⁽¹⁾. Bonding of restorative materials to tooth structure has become one of the prime objectives of modern dentistry⁽⁷⁾. Dentine is composed of two distinct substrates-hydroxyapatite and collagen, which has a low surface free energy, thus showing lower bond strength values in comparison to enamel that contains primarily hydroxyapatite which is homogenous and has a high surface free energy⁽⁸⁾. The present study was conducted to investigate the effects of chlorhexidine and acetic acid act as a cleanser on the

shear bond strength of compomer to dentin. According to the results obtained, group I (chlorhexidine cleanser with compomer) showed highest values for shear bond strength which were statistically different from other groups, the reason may be due to the chemical interaction occur between CHX and Calcium present in the texture of dentin producing a type of chemical bond in addition to that CHX actually absorbed by the dentin, producing prolonged antimicrobial effect in low concentration ⁽⁵⁾. Also group II (Acetic acid cleanser with compomer) showed significant different from group III (d.w. cleanser with compomer), the reason may be due to that acetic acid act as a cleanser agent (disinfectant) to remove the smear layer on the dentin to produce a special bond with the complexity of dentin. However; no significant differences were noted between group I and group II.

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Table I: the experimental groups of base materials.

Group (I)	Chlorhexidine cleanser with compomer
Group (II)	Acetic acid cleanser with compomer
Group (III)	Distal water cleanser with compomer

Figure I: showing the shear bond strength of compomer to dentin wash with three Cleanser agents (CHX, Acetic acid, D.W.)

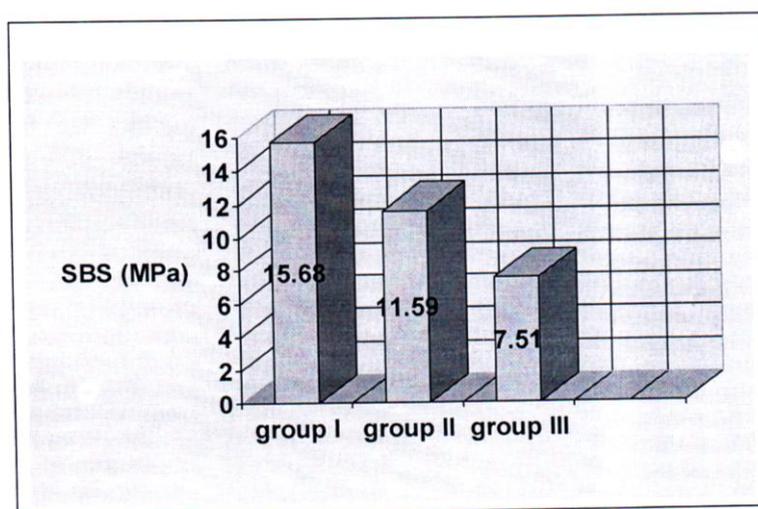


Table II: Comparison of shear bond strength to dentine.

Shear bond strength (Mpa)						
Groups	No. of teeth	Min.	Max.	Mean	SD	SE
I	10	12.72	17.55	15.68	1.94	0.61
II	10	9.89	13.94	11.59	1.6	0.51
III	10	5.94	8.57	7.51	0.94	0.3