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The Effect Of Surface Disinfections Of Gutta-Percha On Shear Bond Strength Of Three Root Canal Sealers

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Abstract

Aim: The purpose was to study the influence of disinfectant solutions on shear bond strength between gutta percha (GP) and different sealers.

Materials and method: 90 GP samples were used. Glassionemer sealer group A (n=20), mineral trioxide aggregate(MTA) sealer group B (n=20), iroot sealer group C (n=20), control group (n=10) for each group. Treated the surface of GP for each group by two disinfectant solutions (NaOCL 2.5%, CHX 2%).Shear bond strength(S.B.S) test was calculate by digital universal testing machine.

Results: iroot sealer (group C) with NaOCL solutions at (2.5%) increase shear bond which were significantly different P≤0.05 from CHX at (2%) and fresh control cones. glassionemer sealer (group A) gaive the lowest measured.

Conclusions: NaOCL solutions at 2.5% left a many pitting investigated on the GP surface. Thus it increased the bond with sealer. The quality of the surface texture and mechanical properties of GP were unaffected by a CHX solution of 2%. Therefore, they were considering as the safe disinfectant solutions for GP cones.

Key words

Gutta percha (gp), disinfection, sodium hypochlorite, chlorhexidine, Root canal sealers. Shear bond strength(S.B.S)

Introduction

The goal of nonsurgical root canal treatment is to remove all necrotic and vital tissues, as well as bacteria, from the root canal system, and to tightly obturate the canal space to prevent micro growth. To avoid canal pollution, the filler material should be free of microorganisms in this case (1). The most used root canal core filler material is GP. Gutta percha cones used directly from the manufacturer's sealed package were shown to be contaminated in several trials. At the moment of opening the package, the number of cultivable microorganisms fairly low. The quantity of germs infecting the GP cones rose as a result of the therapeutic use of packages (2). For GP cone disinfection, the current root canal obturation procedure requires the use of multiple chemicals. NaOCl and CHX are the most efficient disinfectants for GP cones because of their antibacterial properties (3-5).Several studies have demonstrated that choosing the right disinfectant for GP cones is critical, as this disinfectant can impact the mechanical properties and surface roughness of the cones, these may affect final outcome of obturation (6-10). The effect of NaOCl solutions at concentrations of (2.5%) and CHX solutions at concentrations of (2%), when used for GP cone disinfection, on the bonding with sealers was investigated in this study.

Materials and Methods

Disinfection Method: ninety acrylic samples fill the holes by soften GP (Dia-Dent, Netherlands, Korea) were used in this experimental study. Disinfectant solutions used were NaOCL (FAS a commercial household bleach, 6.25% (w/v), Iraq) at concentrations of (2.5%) and CHX (Hibitane, 5%(w/v), Zeneca Limited U.K) at concentrations of (2%) which were used. the samples divided in to three group.A glass ionmer sealer (glassycem,tehnodent,co,ltd,Russia) (n=30) then the group sub divided in to two group A1(10)samples used with Naocl, group A2(10) used with CHX,10 remained fresh without disinfection (control). group B MAT sealer (rootdent, tehnodent, co, ltd, Russia) (n=30) samples, also sub divided as group A, group C iroot sealer (n=30) samples, also sub divided as group A and group B. Cone disinfection made by immersion in Petri dishes contain 20 ml of one of the tested solutions. Then, individual samples were transferred and washed in sterile distilled water for one minute. Then allowed to dry then application the three sealers by use cellulose ring put over GP and fill it with sealer after sealer complete seating samples tested by universal testing machine (3-5).

Mechanical Testing:

Shear bond strength was measured for each sample using computer controlled universal testing machine (TERCO, MT, 3037, Sweden). Samples placed on the grip to avoid plastic deformation and slippage of the cone during testing. Then, the grips were fixed on the testing machine in which a sensor attached to its upper part to control the load applied to the area between GP and sealer. 1nw/minute was reported by the

computer connected to a testing machine until maximum shear failure was obtained. All data calculated were converted to Mpa (6,11-13). shear failure was obtained. And data calculated were converted to Mpa (6,11-13).

Results

Group C iroot sealer with NaOCL at (2.5%) disinfection gives high shear bond value. While, CHX at (2%) would not affect shear bond, which were closely similar to freshly control samples While group A glass ionemer sealer give the low shear bond values with NaOCL. A one-way analysis of variance was used to examine the data for differences, followed by multiple comparisons using the scheffé test. At a $P \leq 0.05$, the results were judged statistically significant. (Tables 1 and 2).Results revealed that iroot sealer with NaOCL at (2.5%) would increase shear bond, which had a significant difference from controlled cones and those submerged on (2%) CHX. But, there were results also showed that shear bond test of GP cones with sealers immersed in CHX at (2%) nearly similar to those of freshly controlled cones.

Discussion

The capacity to clean, shape, disinfect, and three-dimensionally fill a root canal system is critical to the effectiveness of endodontic treatment. (7). One of the most used materials for obturating root canal space is the GP cone. Despite the fact that GP cones are an important component of the aseptic chain, the microbiological cleanliness of the cones chosen prior to their use in filling. The canal is sometimes overlooked (2-4). Root canal filling cones must be able to endure stringent sterilizing methods since they must remain in the root canal for an extended period of time. There have been a few studies on the effects of disinfection on the adhesive characteristics of GP cones and sealer (6-10), but they are few and there are many unanswered questions. The mechanical properties of the GP cone were found to obey Hook's law, indicating that it was a partly crystalline polymeric material (12,13). Several investigations have shown that iroot sealer releases calcium hydroxide during the setting reaction, which is structurally and chemically similar to hydroxyapatite The creation of intra-tubular tags in association with an interfacial mineral interaction layer known as the "mineral infiltration zone" has been seen in recent investigations (Atmeh et al., 2012). (12,13). NaOCL is a powerful oxidizing agent that has the potential to alter the chemical stability of GP cone chain polymer, resin, and waxes. Creates numerous pitting on the surface of GP cones, possibly allowing sealer penetration. All of these factors combined result in a stronger connection between GP and sealer. Same explanation for higher bond strength of MTA decrease bond strength of GP cones to glass ionomer sealer and CHX at 2% related to CHX being the most safe solution for disinfection of GP cones because it does not cause any change on the GP surface, as

Valois et al .(8) ,Valois et al. (9) and Zamany (7).

Conclusions

1- NaOCL solutions at 2.5% would affect on the surface of GP cones, there was a lot of pitting. As a result strengthen the bond.

2- CHx solution at (2%) could not effect Surface texture of GP Therefore, they were considering as the safe disinfectant solutions for GP cones.

Potential conflicts of interest:

There is no conflict of interest.

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Table (1):- scheffé test for the shear bond strength between GP cones and different sealers

Tested sealers groups	Disinfection solutions	Mean(Mpa)±SD Sb test
group A glass ionmer sealer	NaOCl 2.5%	**74.4±7.32 A**
	CHX 2%	**76.4±3.62 A**
	control	**73.7±4.49**
group B MTA sealer	NaOCl 2.5%	**140.7±6.34 A**
	CHX 2%	**138±6.34 B**
	control	**135±12.11**
group C iroot sealer	NaOCl 2.5%	**141.2±9.26 A**
	CHX 2%	**139.9±5.95 B**
	control	**135.2±15.7**

The different letters vertically mean significant difference exist.sb: shear bond strength test

Table (2)-: One way analysis of variance for the shear bond strength between GP cones and different sealers

	Sum of Squares	df	Mean Squares	Fc	Ft
ME[1] Between Groups	**188650.211**	**19**		**168.377**	**1.709***
Within Groups	**9983.900**	**175**	**11425.012**		**0.05**
Total	**197544.111**	**190**	**68.444**		**(17,171)**
TS[2] Between Groups	**1841.568**	**19**		**26.819**	**1.709***
Within Groups	**617.900**	**175**	**96.7543.608**		**0.05**
Total	**2458.468**	**190**			**(17,171)**
EL[3] Between Groups	**167085.316**	**19**	**9282.518**	**294.451**	**1.709***
Within Groups	**5372.500**	**175**	**31.418**		**0.05**
Total	**172457.826**	**190**			**(17,171)**