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Research Article

EVALUATION OF CHLORHEXIDINE EFFECT ON MICROLEAKAGE OF CLASS V COMPOSITE RESTORATIONS WITH ENAMEL AND DENTINAL MARGINS USING A SELF-ETCHING ADHESIVE AFTER 24 HOURS OF STORAGE IN WATER

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ABSTRACT
Micro leakage is a significant clinical problem in restorative dentistry that can lead to treatment failure. Various methods have been used to control leakage that one of them is using chlorhexidine. The aims of this study was to evaluate of chlorhexidine effect on microleakage of class v composite restorations with enamel and dentinal margins using a self-etching adhesive after 24 Hours of storage in water. This study is an in-vivo semi-experimental study that was done in 100 healthy premolar teeth with create cavities of conventional classes v in two groups. In treatment groups, before bonding, the tooth cavities washed with chlorhexidin and kept in distilled water for 24 hours. Results based on the amount of microleakage due to color penetration in the margin of the occlusal and gingival margins, were recorded. The results showed that the amount of microleakage in dentin, in treatment and control groups, had no statistically significant difference (P> 0.05). Also, the amount of microleakage in enamel, in treatment and control groups, had no statistically significant difference (P> 0.05). Results of this study generally showed that using chlorhexidine in class V composite restorations, before bonding, do not causing leakage at the dentin and enamel surfaces. Given the major impact of bacteria in causing microleakage and failure after restoration, using this solution before Bonding in composite restorations, can be beneficial.

Keywords*: Microleakage, Chlorhexidine, Class V Composite, Self-Etching Adhesive*

INTRODUCTION
Regarding to beauty ever increasing needs and concern from poisonous effects of amalgam mercury as well as less invasiveness of cavity cut of the same color restorations; increase the use of restoration's of the same color of tooth name composite that form glass and resin. The most important in composite restorations, is contraction resulting from composite polymerization that at first sight is forming gap between tooth and composite, (Singla *et al.,* 2011) can due to microleakage, secondary decay and at last bond fail (Shafiei *et al.,* 2010). Microleakage, is passing bacteria and its poisons from between restoration edges and prepared cavity. From clinical view, when micro leakage was important, that become distinct probably pulpy instigation form because of bacteria not chemical quality and restorative poisonous material (Bergenholtz *et al.*,1982). Existence and continuation microleakage at edge of restoration resulting to tooth sensitivity and color change and pulp investigation (Shafiei *et al.,* 2010) like physical qualities of composite (contraction of polymerization and difference of heat expansion index between tooth and composite) and break hybrid layer in use of hanging little pollutions at etching and disinfecting or bonding products; are the factors that would due to microleakage at restoration edges (Owens *et al.,* 2003).

So, from time of presentation of resin bonding, permanently try to deduct from microleakage problems. On this base, there are different materials and method for decreasing composite restoration microleakage, some of that, is use of layer method (for deduction of capacity of harden composite at every part) and use of different labels at bellow of composite and so one. But these tries do not fulfilled until now and this problem permanently exist as a clinical obtrusive factor (Salari *et al.*, 2014) and although different generations of connected bonding to dentin, improve for deduction shrinkage effect resulting from polymerization, but now microleakage count as an important clinical problem and with ever increasing expanding use of resin composite and improve adhesive systems, still microleakage is one of the problems of this restorations (Shafiei *et al.*,2010).

In spite of improved the mechanical qualities of materials and polymerization limited to one this layer of resin (Asmussen and Jorgensen, 1972) but in this regard, stress resulting from polymerization would diffuse connection between dentin and resin and due to micro leakage at edge of composite (Cheung, 1990) and at last cause secondary decay (Fuhrer, 1997).

On the other words, in trying to simple making bonding system present to market that is without need to wash part and involve self etching bandings at 1and 2 part. These self-etching bandings welcomed by the public by reason of facility at output. With regard this self-etching bandings have not wash part as well as they don't separate Asmir layer completely (regarding to their weak acidification) so need for disinfect cavity, increase before their use (Retief, 1994). At this direction, in order to disinfect cavity, use of disinfectant solutions before restoration change to one common protocol at restorative dentistry because on base of existing testimonies, use of one antibacterial cleaner solution after preparing cavity, can help to remove potential dangers resulting from bacteria act (Brannstrom, 1986). While, chlorhexidine applies as a one dentin disinfector solution as well as solution diminishing surface of mokans bacteria at surface of decayed roots (Pashley *et al.*, 2004). Recent studies show that use of chlorhexidine before bonding can remove remained bacteria at Esmir layer and in addition to that, it can control metaloproteyaz (mmps) matrix of host (Gendron *et al.*,1999; Meiers and Kresin 1996) that these host enzymes can cause deduction stability endurance at bond. So use of chlorhexidine with control effect on host bacteria, help to band stability of dentin (Fure and Emilson, 1990) as well as with control effect on mmp in long time cause endurance of band (Ersin *et al.*, 2008; Hebling *et al.*,2005). In spite of these cases, some of studies show that chlorhexidone have not any effect on level of microleakage after restoration (Meiers and Kresin, 1996; AlDeeb, 2010; Derhami *et al.*, 2005) and some of the studies report that this disinfector substance can cause negative effects on microleakage (Tulunoglu *et al.*, 1998; Hiraishi *et al.*,2009; Türkün *et al.*,2004). So, with regard to different results of performed studies in relation with effect of chlorhexidine on microleakage after restoration, this study carry out with aim of review effect of chlorhexidine 2% on cavities microleakage of V class composite with use of self etching bonding.

MATERIALS AND METHODS

This study was in form of semi-experimental and intervention that performed in form of in-vivo. The method of performing study was in the form of that 100 permolar tooth of healthy humanity, pulled without break and decay for 3month before perform study, gathered and set in chlorhexidine 5% solution for infection. Then, cut by one person as follows: on every tooth, by one person cut cavities conventional class V with 2 mm dimensions at 3 mm occlusal and ginginival dimension an mesodistal dimention and with 1/5mm depth, by 0/5 fishor frez and at 1mm in bellow and top of the CEJ; and confirmed by tow person of teachers and residents from restorative part. Frezes replaced after 10 cut. Cut teeth incidentally, separate to two 50 groups of clinical and control. In this study, clear FIL se bond bonding of kuraray medical INC Japan company, use Filtak2250 3m ESPE composite of dental products USA company. At control group, primer of clear fil se, set on cavity position for 20 second by micro brash and dry air povar quietly for 5 second and then adhesive clear FIL se set in cavity by other microbrash and kiverd from

1mm distance with 600mw/em out put light intensity for 10 second, then 2250 composite respectively set at mesial and distal and middle of cavity, and each one kivered for 20 second and then perform final kivering for 40 second. The light device that used at our studies, was Junior VIPs biscoumbur GCHAZL. In clinical group before use of bonding, cavities washed with 2%chlorhexidine of consepsis ULTRADENT USA company for 60 second and then set clearfil se bond bonding and filtak 2250 3m EPSE composite and performed similar restoration of control group. After these stages, restorated teeth, preserved at two group in distilled water for 24 hours at 37 centigrade degrees in Incubator.

After 24 hours APKS and root of tooth covered with wax gum and then covered by 2 layer of nail varnish on over parts of tooth until 1mm margin restoration to prevent microleakage inter. Each of 2clinical and control groups set separately at %1 metilen blue colorful solution and for 24 hours remain at room temperature, after needed time passing, teeth in form of bakilingualy cut by cutting device (struers Denmark) and samples (carl zeissincoberkochen Germany) under Esterio microscope with 2 double enlargement, review by 2 person separately and results based on the amount of microleakage due to color penetration in the margin of the occlusal and gingival margins, were recorded.

Grading method the amount of color penetration as follows:

0-penetration color is not seen

1-penetration color less than 1/2distance to parapet

2penetration color more then½ distance to expanding Axially walls but is not received to parapet

color Penetration expand to parapet Exialy.

Used qualities in study

Material	**Batch#**	**Manufacturer**	**Composition**
Clearfil SE Bond	41502	Kuraray Medical Inc ,Okayama, Japan	Primer: MDP, HEMA, hydrophilic dimethacrylate, photoinitiator, water bond: 10-MDP, Bis-GMA, HEMA, hydrophilic dimethacrylate, microfiller, photoinitiator

RESULTS

In this research, in whole 100 premolar tooth of healthy humanity, review in form of in-vivo.in connection with reviewing the amount of restorations microleakage of class V composite at control group with occlusal and gingival separation, results show that from view the amount of restorations microleakage of class V composite at control group, meaning one group, without chlorhexidine, in occlusal separation, in most cases, meaning (72%) penetration color is not seen and in (3%) of cases too, penetration color expand to exialy walls. And with gingival separation in (58%) of cases, penetration color is not seen and in 7% of cases, penetration color expand to exialy walls.

In reviewing the amount of restorations microleakage of class V composite in clinical group with occlusal and gingival separation, was from other aims of this study, founds show that from the view of the amount of restoration microleakage of class V composite at clinical group, meaning group with chlorhexidine in occlusal separation , in 80% of cases , penetration color is not seen and just in one case or 2% of cases,

penetration color is expand to exial walls, in gingival separation in 64%of cases , penetration color is not seen and in 2 or 4% of cases too, penetration color expand to exialy walls.

Table 1: Review the Microleakage Amount in Class V Composite Restorations in Control Group (Without Chlorhexidine) in Dentine and Enamel Separation.

Sum Plenty (%)	Dentine Plenty (%)	Enamel Plenty (%)	Microleakage amount
65 (65)	29 (58)	36 (72)	Color penetration is not seen
14 (14)	7 (14)	7 (14)	Color penetration less than 2/1 distance to walls
11 (11)	7 (14)	4 (8)	Color penetration more than 2/1 distance to exialy walls expand but not received to walls
10 (10)	7 (14)	3 (6)	Color penetration expand to exialy walls
100 (100)	50 (100)	50 (100)	Sum

Table 2: Review the Microleakage Amount in Class V Composite Restorations in Clinical Group (With Chlorhexidine) in Dentine and Enamel Separation.

Sum Plenty (%)	Dentine Plenty (%)	Enamel Plenty (%)	Microleakage amount
72(72)	32(64)	40(80)	Color penetration is not seen
15(15)	7 (14)	8(16)	Color penetration less than 2/1 distance to walls
10(10)	9(18)	1(2)	Color penetration more than 2/1 distance to exialy walls expand but not received to wals
3(3)	2(4)	1(2)	Color penetration expand to exialy walls
100 (100)	50 (100)	50 (100)	Sum

:

Comparison the amount of gingival microleakage in two groups of clinical and control with use of vilcakson test, show that quantity of presented statistic is equal 1140 with the amount of significant 0/38 (more than 0/5) and show that amount of gingival microleakage in two groups of clinic and control, have not statistical significant comparison.

Table 3: Comparison Gingival Microleakage Amount in 2 Group of Clinical and Control in Dentine and Enamel Separation.

Gingival Microleakage				Group
P_Value	**Test quantity**	**Sum of ranks**	**Average of ranks**	
0/386	1140	2635	52/70	Without chlorhexidine
		2415	48/30	With chlorhexidine

So comparison the amount of occlusal microleakage in two groups of clinic and control, with use of vilcakson, show that quantity of presented statistic is equal 1129/5with the amount of significant 0/26(more than %5 that show the amount of occlusal microleakage in two groups of clinic and control, have not statistical significant comparison.

Table 4: Comparison Occlusal Microleakage Amount in 2 Group of Clinical and Control in Dentine and Enamel Separation

Gingival microleakage				Group
P_Value	Test quantity	Sum of ranks	Average of ranks	
0/266	1129/5	2645/5	52/91	Without chlorhexidine
		2404/5	48/09	With chlorhexidine

In this study also, situation of microleakage after restoration in two groups of control and interference, review with dentin and enamel separation, by vilcakson test. This review show that amount of occlusal and gingival microleakage in control group, have significant comparison with together. Meaning, amount of microleakage in dentine part is more than enamel part of tooth and this comparison was significant from statistical view (p-value=/022,z=-2/28). Also the amount of gingival and occlosal microleakage in intervention group, meaning group with chlorhexidine; they have not show significant comparison with together that this amount of microleakage was more in gingival part (p-value=/006, z=-2/754). (Table 5, 6 and graphs 1,2).

Table 5: Comparison Amount of Occlusal and Gingival Microleakage in Control Group

P_value	Amount of z	Sum of ranks	Average of ranks	Number		Group
0/022	-2/287	57/50	7/19	8	Negative Ranks	control
		195/50	13/96	14	Positive Ranks	
				28	Ties	
				50	Total	

Table 6: Comparison the Amount of Occlusal and Gingival Microleakage in Clinical Group

P value	Amount z of	Sum of ranks	Average of ranks	Number		Group
0/006	-2/754	16/00	4/00	4	Negative Ranks	Therapy
		120/00	10/00	12	Positive Ranks	
				34	Ties	
				50	Total	

Discussion

The ability of one gingival banding factor, for preserving ceiled tooth restoration, interpret as a clinical success predicator (Van Meerbeek *et al., 2010*). And attachment of resin composites to tooth surface, is improved with use of remover factors of Esmir layers, dentin primers and bonding factors (AlDeeb, 2010). Although, bacteria existence in Esmir layer showing basic problem, because it can result to microleakage, secondary decay and at last restoration fail (*Cardoso et al.,* 2011; AlDeeb, 2010). On this base, now a days, use of disinfectant substance of cavity like chlorhexidine, for removal bacteria from tooth surface, after tooth cut and before setting restoration substance, have been accepted publicity. Although some investigator believe that use of disinfectant substance would affect on ability of resins ceiling of gingival attaching and cavities microleakage increase (Türkün *et al.,* 2004; Abed Kahnamoee *et al.,* 2011).

Then in order to review probable effects of chlorhexidine, in this study, 100 pulled tooth of humanity premolar, in-vivo method, after cut class V and wash with chlorhexidine solution, before use of banding, are reviewed.

Before review the amount of restorations microleakage of composite class V in control group in occlusal and gingival separation show that from view the amount of restorations microleakage of composite class V control group (group without chlorhexidine), in most cases, meaning (72%), is not seen penetration color and in (6%) of cases too, penetration color expand to exialy walls. So, from the view the amount of gingival microleakage of restorations class V composite in control group (group without chlorhexidine), in 58% of cases, is not seen penetration color and in 14% of cases, penetration color expand to exialy walls and also study result in clinical group (with chlorhexidine) how that amount of occlusal microleakage of restorations class V composite in clinical group (with chlorhexidine), in 80% of cases, is not seen penetration color and just in 2% of cases, penetration color expand to exialy walls. Review of gingival microleakage of restorations class V composite in clinical group (group with chlorhexidine), in 64% of cases, is not seen penetration color and in 2 or 4%of cases, penetration color expand to exialy walls. Compare the amount of gingival microleakage in two group of clinic and control, with use of vilcokson show that amount of gingival microleakage in two group of clinical and control in occlusal and gingival separation, they have not statistical significant comparison (p>0/05). So, in present study, amount of occlusal and gingival microleakage in two groups of clinical and control in occlusal and gingival separation, with use of vilcokson test, show that amount of occlusal microleakage is compare in two groups of clinic and control and results show that in each two group, totally gingival microleakage is higher than occlusal microleakage (p>0/05). These founds totally show that use of chlorhexidine is restorations class V composite with use of self-etching resin, is not result to microleakage increase in occlusal and gingival surfaces. In opposite, is seem that use of this disinfectant factor relatively cause

band improvement and at last deduction in microleakage amount, though this amount from statistical view is not significant.

In performed study by ALDeeb in 2012, using chlorhexidine with self-etching adhesive, have not any effect on microleakage amount. In other words at this study, microleakage by disinfectant, both before and after of banding self-etching adhesive, is not effected significantly(AlDeeb, 2010). In Meiers study and his colleagues (1996), at disinfecting with chlorhexidine in tenure adhesive, etching and wash and self-etching syntech, that chlorhexidine immediately use after cavity cut and before taking Esmir layer by etching and have not effect on microleakage. In Geraldo martins study and his colleagues (2007), that review 2 part self-etching attaching resin, chlorhexidine application, have not effect on amount of microleakage after restoration . Derhami and his colleagues (1995) too, show at study that disinfecting cavity have not any negative effect on coopperation of gingival adhesives to gingival at restoration of class 2 composite (Derhami *et al.,* 2005). Cao and his colleagues (1995), also report that between disinfectors of cavity that have chlorhexidine, conspsis 2% is just disinfector that do not deduct stability of adhesive band to dentine.

In IRAN, in Shafiei study and his colleagues (2010), that review chlorhexidine effect in two system of etching and wash, and two self-etching system; results show that chlorhexidine application after etching with phosphoric acid and wash in 2 system of Excite and cotchbondmultis-purpose SMBP and before application of acidification primer cleafilse CSEB or 2b 1bond self-etching adhesive, have not effect on microleakage of gingival or insizali edges at class V cavities. In Abed Kahnamoee study and his colleagues (2011) that review in order to affect cavity disinfection with chlorhexidine on microleakage of gingivali edge at class 5 cavities with restorated composite and one part self-etching banding (7^{th} generation),carry out in vivo in caw tooth; after 24h results show that, with or without chlorhexidine, there is not significant statistical comparison in amount of microleakage at 2 restorated group.

High results accompany with recent study after use from SE FIL clea self-etching adhesive that show, use of chlorhexidine in sill of composite restorations edged have not entering with self-etching adhesive application.

Nevertheless in Tulungolu study and his colleagues (1998), showed that use of chlorhexidine solution on microleakage of prime and bond and syntace 2 adhesive, have overwhelming effect and have negative effect on ability of resin ceiling a 2 part total etch gingival bonding (5^{th} generation) and cause more microleakage that this comparison for reason of difference in dentin structure of baby tooth in relation to permanent dentine and negative effect of disinfector substance on dentine of baby tooth. Hiriashi and his colleagues (2009), report that use of chlorhexidine before self-etching adhesive, due to increase in amount of microleakage. Justification of this situation by these investigators that is, this lateral effects resulting from use chlorhexidine are directly on layer Esmir.

In some studies, negative or positive effects of chlorhexidine on microleakage amount, relate to effect of this substance on stability of sements bond that in this direction too, different studies, present different results. For example, in Torkan study and his colleagues (2004), report increase in stability of resin cements band after use of chlorhexidine, but this increase is not significant statistically. In De Castro study and his colleagues (2003) and Bocangel and his colleagues (2000), chlorhexidine have not effect to dentin on bond stability of 3 step total etch bonding (Perdigao *et al.*,1997) and 2 part total etch bonding and 2 part self-etch(De Castro *et al.*,, 2003).

In this regard, Vievia (2003) reported deduction of band stability, following use of chlorhexidine in baby teeth (30) and in Meiers study and his colleagues (1996), chlorhexidine cause deduction of band stability at 2 part total etch banding to dentine. In spite of these cases, in the number of studies report that chlorhexidine cause improve of band stability at total etch bonding with dentin(31,32 Carrilho *et al.*,2007; Pappas*et al.*,, 2005).

This difference in various studies results, and such as this study, can Result in different compound of solution in used banding, without wash disinfecting substance before bonding process, use of different sobstray of banding, various chemical compound of bonding, composition disinfecting substance with other washing substance and use chlorhexidine after etching acid part in total etch banding and too, long time of in-vivo review after use of this solution as well as difference at penetration color in dentin and dentine of clinic and control group can for reason of structural difference in dentin and dentine tooth.

Nowadays self-etch adhesives enter to market with aim of resembling band stability of dentin and dentine but regarding that dentin is on dynamic sobstray, with companion complicated structure and its biologic action, prevent from of one predictable band.

Totally, investigators believe, chlorhexidine application, after Acid etching part in total etch banding for reason of have controlling quality of metaleoprotienaz (that result to breaking collagen net), cause prevention of collasion analysis and hybridized layer preserve and consequently cause improvement of band stability(Abed Kahnamoee *et al.*, 2011; Carrilho *et al.*, 2007; Pappas *et al.*, 2005). Also, chlorhexidine have ionypowerfull positive charge that let him simply attach to phosphate group (Salari *et al.*, 2014; Meiers and Kresin, 1996). For this reason, have very tendancy to attach to tooth surface. This tendency increase with tooth etch that cause good wettability at dentin surface by this substance that can cause prevent from increase the amount of microleakage (Salari *et al.*, 2014). Singla and his colleagues (2011) on base of your study results, know chlorhexidine as a deduction factor of microleakage and reported its factor, the reason for closing occlusal tools by chlorhexidine. (Singla *et al.*, 2011) also, seems the effect of disinfector solution coordinate with active components in them and kind of adhesive system is changeable.

Final conclusion

Totally results of this study show that chlorhexidine application in class V composite restorations, before use of 2 part self-etching bonding (SEFIL elea) and after 24 h preserve in distilled water in37 centigrade degrees in Ancobator; do not cause microleakage existence in occlusal and gingival surfaces and even in some cases apparently cause stability in composite attachment and consequently deduction in amount of microleakage. With attention to basic effect of bacteria in creation of inflammation and tooth pulps and following of that, microleakage and fail after restorations and too chlorhexidine effect as a effective disinfector factor on bucalmicro organism that responsible for restorative clinics fail; use of this solution before banding in composite restorations, can be beneficial.

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