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A COMPARITIVE EVALUATION OF VIVASENS AND SYSTEMP DESENSITIZERS ON SHEAR BOND STRENGHT OF COMPOSITE RESIN TO HUMAN DENTIN: AN IN VITRO STUDY.

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Abstract:
Background
Post-restorative dentinal hypersensitivity is a common occurrence and happens due to the movement of the dentinal fluid in the exposed tubules, which excites the pulpal nerves resulting in perceived sensation. The use of dentin desensitizers has been one of the most common approaches for management of post- restorative dentin hypersensitivity.
Material & Methods
36 human premolars extracted for orthodontic purpose were collected after taking patient's consent in Sri Siddhartha Dental college, Tumkur. Shear bond strength test was done using Instron universal testing machine at RV-TIFAC composite design center, Composite technology park, Bangalore. The teeth were carefully cleaned using a hand scaler and water-pumice slurry in prophylaxis rubber cups and stored in 0.1% thymol solution until subjected to use. The sample teeth were assigned to the following product (Table 1) groups: Groups: Per group (n = 12), Group 1: Prime and Bond NT, Germany, Group 2: Vivasens desensitizer, Ivoclar Vivadent Schaan, Liechtenstein, Switzerland, Group 3: SystemP, Ivoclar Vivadent Schaan,
Results
The mean shear bond strength between all the groups was statistically significant. So further pairwise comparisons between the groups was carried out using Mann-Whitney test. The test result shows that Group 1 values statistically significant difference between Group II and Group III (P<0.05).
Conclusion
Within the limitation of the present in vitro study SystemP desensitizer is considered to be a promising option for the treatment of dentin hypersensitivity and to enhance bond strength during composite resin restorations. It can be stated that use of desensitizers showed increased shear bond strength values as compared to application of the adhesive alone. The SystemP desensitizer have better bond strengths than Vivasens.
Key Words: *Vivasens. SystemP, Desensitizers, Shear Bond Strength, Composite Resin, Human Dentin.*

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I. Introduction

Post-restorative dentinal hypersensitivity is a common occurrence and happens due to the movement of the dentinal fluid in the exposed tubules, which excites the pulpal nerves resulting in perceived sensation.[1-5]The use of dentin desensitizers has been one of the most common approaches for management of post- restorative dentin hypersensitivity. Dentin desensitizers are applied to the tooth surface after etching and prior to the application of the bonding agent. The dentin desensitizers block the dentinal tubules and bring about a reduction

in hypersensitivity.[6,9]Current desensitizers include components such as fluoride, triclosan, benzalkonium chloride, ethylene diaminetetraacetic acid and Glutaraldehyde.[9]Dentin adhesive/desensitizer combination can be used to mechanically block patent dentinal tubules or physiologically decrease the excitability of the intradental nerves to relieve hypersensitivity. Vivasens, the desensitizing agent contains organic acids such as phosphonic acid methacrylate and solvents such as ethanol which induce the precipitation of proteins in the dentin liquid. Moreover, the sealing effect is enhanced by co-precipitating polyethylene glycol dimethacrylate, which is present in Vivasens. Polyethylene glycol dimethacrylate is a condensation polymer, which acts as an organic filler and cross links molecular chains of polymers.[10]SystemP is a desensitizer containing Glutaraldehyde and hydroxyl ethyl methacrylate (HEMA) which can reduce hypersensitivity by sealing or occluding the exposed dentinal tubules by precipitating plasma proteins in the dentinal fluid.[11]However, there are no consensus and limited data available to evaluate their effectiveness in improving bond strength to resin composites. Hence, the purpose of this in vitro study is to compare the effect of Vivasens and SystemP desensitizers on shear bond strength of composite resin to human dentin.

II. Aims and Objectives

The aim of the study was to evaluate the effect of VIVASENS and SYSTEMP desensitizers on the shear bond strength of composite resin to human dentin. Objectives are to compare and evaluate the shear bond strength of VIVASENS desensitizer on composite resin and to compare and evaluate the shear bond strength of SYSTEMP desensitizer on composite resin.

III. Materials and Methods

It is a vitro experimental design which was done under laboratory settings. It was done in pre-clinical laboratory, Department of Conservative Dentistry and Endodontics, Sri Siddhartha Dental college, Tumkur. Shear bond strength test was done using Instron universal testing machine at RV-TIFAC composite design Centre, Composite technology park, Bangalore. Total duration of study was 3 months.36 human premolars extracted for orthodontic purpose were collected after taking patient's consent. The teeth were carefully cleaned using a hand scaler and water-pumice slurry in prophylaxis rubber cups and stored in 0.1% thymol solution until subjected to use. Materials used for study were 37% Phosphoric acid (Scotchbond Multi-purpose Etchant,3M), Dentin Bonding Agent Prime and Bond NT (Dentsply, Germany), Resin composite Filtek Z-250 (3M/ ESPE, St Paul,MN,USA), Silicon carbide disc (Moyco Precision Abrasives, Montgomeryville, PA, U.S.A), Vivasens desensitizer (Ivoclar Vivadent Schaan, Liechtenstein, Switzerland), SystemP Desensitizer (Ivoclar Vivadent Schaan, Liechtenstein, Switzerland), Distilled water (Nice Chemical Laboratory Supplies Ltd, Kochi, India), Self-Cure Acrylic (DPI India). Sound human extracted premolar teeth with no obvious defects were included in the study. Teeth with occlusal caries/restorations, presence of cracks, obvious surface defects or developmental anomalies were excluded from the study. Random Sampling technique was used. For 80% power with significance level of 0.05 and effect size of 0.4 to be achieved, the total number of samples needed was 36 which were divided into three groups (n=12), calculated using G Power software version 3.1.9.2.

IV. Methodology

A total of 36 freshly extracted human premolar teeth were taken and were randomly divided into three groups of 12 samples each. The occlusal surface of each tooth was ground under running water to expose middle depth dentin and the specimens were treated with 37% phosphoric acid for 15 seconds and thoroughly rinsed with water for the same amount of time with water spray. The sample teeth were assigned to the following groups (Table 1) groups: Groups: Per group (n = 12), Group 1: Prime and Bond NT, Germany, Group 2:Vivasens desensitizer, Ivoclar Vivadent Schaan, Liechtenstein, Switzerland, Group 3: SystemP, Ivoclar Vivadent Schaan, Liechtenstein, Switzerland, Group 1:The samples were treated with the application of the dentin-bonding agent, alone which served as controls, Group 2: Vivasens desensitizer was applied with applicator tip over the dentin surface following which bonding agent (Prime and Bond NT Dentsply, Germany) was applied and cured as per manufacturers' instructions, Group 3: SystemP desensitizer was applied to dentin for 10s with the help of an applicator brush and was allowed to remain on the tooth surface for 20 s. Then the area was lightly dried with an air syringe following which bonding agent (Prime and bond NT) was applied and cured as per manufacturers' instructions, Composite resin posts of dimension 2 mm in height and width were then built on the treated surfaces and the specimens were stored in distilled water for 48 hours and prior to testing were mounted on cold cure acrylic resin stubs. Universal testing machine (Instron) was used to apply the shear load until specimen failure occurred at a crosshead speed of 0.5 mm per minute. Maximum load applied and failure load was recorded for each specimen and the shear bond strength was calculated.

V. Statistical Analysis

The data were subjected to statistical analysis using One-way ANOVA followed by post hoc tests was used for statistical analysis of differences between groups at a significance level of 0.05. All analyses were performed using SPSS v.19 (SPSS Inc, Chicago, IL, USA).

VI. Results

The present in-vitro study was undertaken to compare the effect of VIVASENS and SYSTEMP desensitizer on shear bond strength of composite resin to human dentin. The study used universal testing machine to detect the shear bond strength of VIVASENS and SYSTEMP desensitizer to human dentin. In this study, total number of specimen was 36 with 12 in each group. The test for normality is mentioned in Table 1. The comparison of mean shear bond strength of all the groups is mentioned in table 2 and chart 1. The pairwise comparison of the groups is mentioned in table 3. The data was analyzed by Shapiro wilkis test, Mann Whitney and Krushkal Wallis tests. Table 1 shows the test result of normality assumption, expect Group 3 other groups data was normally distributed ($p<0.05$) so all the analysis was carried out using non-parametric test. Table 2 shows the mean and median shear bond strength between the groups, the mean shear bond strength between the three groups was statistically significant with $p< 0.005$ Highest value was observed in SYSTEMP treated group (Group III) followed by Group II and Group I. Table 3 shows the pairwise comparison of the materials tested. The mean shear bond strength between all the groups was statistically significant. So further pairwise comparisons between the groups was carried out using Mann-Whitney test. The test result shows that Group 1 values statistically significant difference between Group II and Group III ($P<0.05$). There is significant difference between Group II and Group III values ($p<0.05$)

Chart 1: The comparison of shear bond strength of all the groups

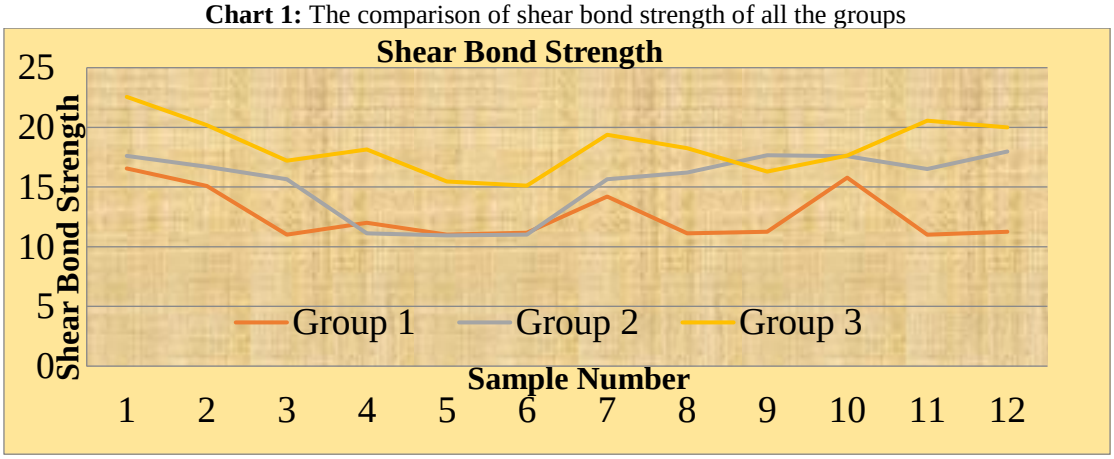

Table 1: Tests for normality

Tests of Normality							
	Material	Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Share Bond Strength	Group 1	0.321	12	0.001	0.752	12	***0.003***
	Group 2	0.289	12	0.006	0.774	12	***0.005***
	Group 3	0.109	12	0.200	0.973	12	0.943

Table 2: Intergroup Comparison of mean Shear Bond Strength in MPaShare Bond Strength (Kruskal- Wallis Test)

	N	Mean	SD	Median	Min.	Max.	Chisqure*	P value
Group 1	12	12.63	2.139	11.27	11.01	16.56	16.703	***<0.001***
Group 2	12	15.39	2.740	16.37	10.95	17.98		
Group 3	12	18.40	2.226	18.21	15.12	22.56		

Table 3: Pair wise comparison of groups (Mann-Whitney Test)

	Group 2		Group 3	
	U value	P value	U value	P value
Group 1	37.50	***0.046***	5.00	***<0.001***
Group 2	-	-	30.00	***0.014***

VII. Discussion

Dentinal hypersensitivity has been reported after placement of restorations and more so with composite resin restorations. Application of dentin desensitizers has been one of the recommended modalities for treatment of the same.[1-6] In vitro Studies have shown that application of dentin desensitizers has an influence on the bond strength between the tooth surface and the restoration.[10,14]Sevimay et al. conducted a study to evaluate the bond strength of composite resin on dentin surfaces that have been treated with different desensitizing agents: SystemP Desensitizer, Hybrid Bond, BisBlock, Gluma Desensitizers and concluded that specimens treated with desensitizers yield significantly lower mean bond strength except SystemP desensitizer which did not detrimentally influence the bond strength.[15]However there are conflicting reports on the effect of dentin desensitizing agents on bond strength of adhesive restoration, and thus is the need for the study . In the present study etch and rinse adhesive technique is followed during the restorative procedure as it is considered to be the most efficient and suitable option for dentin adhesion. Shear test is used in the present study as it is considered to be more representative of the clinical situation. Della Bonnre and Vannort evaluated by Finite Element Analysis the stress distribution in different configuration of a composite/ceramic specimen for shear bond strength testing. They found that stress distribution has a great influence on the failure mode and they considered the shear test to be more appropriate to measure the strength of the base material.[18]There is statistically significant difference in shear bond strength values between the experimental groups ($p<0.05$) hence the null hypothesis is rejected. In the present study SystemP (group III) showed maximum shear bond strength value of 22.56MPa when compared to Prime and Bond NT (Group I-Control) and Vivasens (Group II). This may be attributed to the stabilization of the collagen fibril network by Glutaraldehyde, facilitating easy resin infiltration.[7,19-22]. The lower bond strength observed with Vivasens can be attributed to the precipitation of Ca salts by phosphonic acid methacrylate modified polyacrylic acid present in Vivasens. In addition, the potassium ions of its fluoride component support precipitation of the salts[16-19] and the precipitation of microcrystals and mineral deposits into dentin tubules prevent resin infiltration.[7,21-22] The results of the present study are in accordance with Eeshan Arub Mushtaq et al who observed similar higher bond strength values with SystemP desensitizer and recommended the use of SystemP as a better desensitizer in reducing dentinal hypersensitivity.[23]

VIII. Conclusion

Within the limitation of the present study SystemP desensitizer is considered to be a promising option for the treatment of dentin hypersensitivity and to enhance bond strength during composite resin restorations. It can be stated that use of desensitizers showed increased shear bond strength values as compared to application of the adhesive alone. The SystemP desensitizer have better bond strengths than Vivasens.

IX. Limitations

However, the in vitro condition of the study limits the clinical relevance due to the variability in the study design and restorative protocol. However, the validity of this in vitro study could be appreciated through the further clinical trials.

References

[1] Auschill TM, Koch CA, Wolkewitz M, Hellwig E, Arweiler NB. Occurrence and causing stimuli of postoperative sensitivity in composite restorations. Oper Dent 2009; 34:3-10.

[2] AkpataEs, Behbehani J. Effect of bonding systems on postoperative sensitivity from posterior composites. Am J Dent 2006; 19:151-154.

[3] Bartold PM. Dentinal hypersensitivity: a review. Aust Dent J 2006; 51:212-218.

[4] Jacobsen PL, Bruce G. Clinical dentin hypersensitivity: understanding the causes and prescribing a treatment. Contemp Dent Pract 2001; 2:1-12.

[5] Pashley DH, Carvalho RM, Pereira JC, et al. The use of oxalate to reduce dentin permeability under adhesive restorations. Am J Dent 2001; 14:89-94

[6] Pashley DH. Potential treatment modalities for dentin hyper- sensitivity: in-office products. In: Addy M, Embery G, Edgar WM, Orchardson R, editors. Tooth wear and sensitivity: clinical advances in restorative dentistry. London: Martin Dunitz 2000:351-365.

[7] Huh JB, Kim JH, Chung MK, Lee HY, Choi YG, shim Js. The effect of several dentin desensitizers on shear bond strength of adhesive resin luting cement using self-etching primer. J Dent 2008; 36:1025-1032.

[8] Schupbach P, Lutz F, Finger WJ. Closing of dentinal tubules by Gluma desensitizers. Eur J Oral sci 1997; 105:414-421.

[9] Kolker JL, Vargas MA, Armstrong sR, Dawson DV. Effect of desensitizing agents on dentin permeability and dentin tubule occlusion. J Adhes Dent 2002; 4:211-221/

[10] Poornima J, SrinivasuluS, Vidhya S. Degree of conversion of two dentin bonding agents with and without a desensitizing agent using fourier transform infrared spectroscopy: An *in vitro* study.

[11] Nair M, Paul J, Kumar S, Chakravarthy Y, Krishna V, Shivaprasad. Comparative evaluation of the bonding efficacy of sixth and seventh generation bonding agents: An in vitro study. J Conserv Dent 2014; 17:27-30.

[12] Behr M, Rosentritt M, Regnet T, Lang R, & Handel G (2004) Marginal adaptation in dentin of a self-adhesive universal resin cement compared with well-tried systems Dental Materials 20(2) 191-197.

[13] Karaagaclioglu L, & Yilmaz B (2008) Influence of cement shade and water storage on the final color of leucite reinforced ceramics Operative Dentistry 33(4) 386-391.
[14] Bayle MA, Gregoire G, & Sharrock P (2007) The role of acryl phosphonic acid monomers in the formation of hybrid layers based on self-etch adhesive Journal of Dentistry 35(4) 302-308.
[15] Al Qahtani MQ, Platt JA, Moore BK, Cochran MA. The effect on shear bond strength of rewetting dry dentin with two desensitizers. Oper Dent 2003; 28:287-296.
[16] Assis CA, Antoniazzi RR, Zanatta FB, Rosing CR. Effcacy of gluma desensitizer on dentin hypersensitivity in periodontally treated patients. Braz Oral Res 2006; 20:252-256.
[17] Lehmann N, Degrange M. Effect of four desensitizer on the shear bond strength of three bonding systems. Eur Cells Mat 2005;9(1):52-53.
[18] Ritter AV, Bertoli C, swift EJ. Dentin bond strengths as a function of solvent and gluteraldehyde content. Am J Dent 2001; 14:221-226.
[19] Walter R, Miguez PA, swift EJ Pereira PNR. Long-term bond strengths to dentin treated with different re-wetting solutions. Am J Dent 2008; 21:143-147.
[20] Akca T, Yazici AR, Celik C, Ozgunaltay G, Dayangac B. The effect of desensitizing treatments on the bond strength of resin composite to dentin mediated by a self-etching Primer. Oper Dent 2007;32(5):451-56.
[21] Ravikumar N, shankar P, Indira R. shear bond strengths of two dentin bonding agents with two desensitizers: An in vitro study. Journal of Conservative Dentistry 2011;14(3): 247-251.
[22] Eick. J.D; Welch FH Dentin adhesives-do they protect the dentin from acid etching. Quintessence International 1986 Sep;17(9):533-544.
[23] Eeshan Arub Musthaq. Vijay Mathai, Rajesh Sashidharan Nair, Jeya Balaji Mano Christaine Angelo. The effect of dentin desensitizer on the shear bond strength of composite to dentin using three different bonding agents: An in vitro study. J Conserv Dentv. 2017 Jan-Feb; 20(1): 37-40.

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