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EFFECT OF DENTINE DESENSITIZING AGENTS ON THE BOND STRENGTH OF COMPOSITE RESIN TO DENTINE.

Endodontics

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ABSTRACT

Hypersensitivity is a common clinical multi-etiological problem. Many desensitizing treatments are there to overcome hypersensitivity. The aim of the study is to evaluate the effect of desensitizing dentifrice containing sodium calcium phosphosilicate and Diode laser on the tensile bond strength of composite to dentine.

Materials and Methods: Thirty sound human molars were used. Enamel was wet abraded to expose flat dentin surfaces and polished with sandpaper. The specimens were then divided into three groups (n = 10) based on the type of dentin-desensitizing treatment given.

Group 1- was the control group where no desensitizing agent was used.

Group 2-was treated with desensitizing dentifrice containing sodium calcium phosphosilicate.

Group 3- was treated with Diode laser.

Afterwards, the desensitized specimens were treated with one step self-etch adhesive (Tetric N Bond) according to manufacturer's instructions and composite micro cylinders were packed. The specimens were then examined for tensile bond strength using universal tensile machine.

Statistical analysis: The recorded values were subjected to statistical analysis using the SPSS software. One-way ANOVA, and Post-hoc Tukey HSD test were performed to evaluate the tensile bond strength values. For the entire evaluation, $P < 0.05$ was considered to be statistically significant.

Results: Higher tensile bond strength was seen in the control group when compared with the experimental groups

Conclusion: Based on the results of this study, dentifrice and Laser pretreated dentin has lower tensile bond strength with resin composites as compared to dentin that is untreated

KEYWORDS

Sodium calcium phosphosilicate, Diode laser.

INTRODUCTION

Dentine hypersensitivity is one of the main causes of pain and discomfort which calls for an unscheduled or emergency dental visit.[1]"Dentine hypersensitivity(DH) is characterized by short, sharp pain arising from exposed dentine in response to stimuli typically thermal, tactile, chemical, evaporative or osmotic which cannot be ascribed to any other dental defect or pathology".[2] Type A delta fibers are supposed to be responsible for dentinal sensitivity which are probably activated by the hydrodynamic process which is in accordance to Branstorm's Hydrodynamic Theory.[3]

Studies have reported that non-carious cervical lesions and dentine hypersensitivity in adult population has prevalence rates which ranges from 5-85% and 2-74% respectively.[4]A slightly higher incidence of DH is reported in females than in males.[5] While DH can affect the patient of any age, most affected patients are in the age group of 20-50 years, with a peak between 30 and 40 years of age.[6]

There are many desensitizing treatments available to overcome dentine hypersensitivity.[7] Management of DH is primarily aimed at either occluding the dentinal tubules or making coagulates inside the tubules.[8]

Patients are often prescribed over-the-counter desensitizing agents which include toothpastes, mouthwashes and chewing gums. It is reported that formulation containing bioglass can promote remineralization of dentinal tubules. Silica, the basic component of bioglass acts as a nucleation site for precipitation of calcium and phosphates. So the apatite layer formed by the application of bioglass occludes the dentinal tubules.[9]

Laser is an acronym for light amplification by stimulated emission of radiations. Various studies have shown that lasers can be used in the effective management of DH. Diode laser is thought to act by affecting the neural transmission in the dentinal tubules. It has also been proposed that lasers coagulate the proteins inside the dentinal tubules and block the movement of fluid.[6]

Following the treatment of dentine hypersensitivity, teeth might require esthetic rehabilitation. Therefore the purpose of this study is to evaluate the influence of topically applied desensitizing dentifrice containing calcium sodium phosphosilicate and Diode laser on the tensile bond strength of composite resin to dentine.

MATERIALS & METHODOLOGY

Thirty human molar teeth, extracted due to periodontal reasons were taken for the study. Desensitization in experimental groups was done with calcium sodium phosphosilicate and Diode laser respectively. Bonding was done with self-etch adhesive (Tetric N Bond) according to manufacturer's instructions.

Occlusal surfaces of all the samples were wet abraded with diamond disc under copious irrigation to expose flat dentinal surface and polished with 120 and 320 grit sand paper.

All the specimens were divided into three groups.

Group 1: Stored in distilled water with no dentin pretreatment.

Group 2: Occlusal surfaces were brushed with calcium sodium phosphosilicate containing dentifrice for 4 minutes using Colgate sensitive tooth brush (ultra soft), for 14 consecutive days.

Group 3: Diode laser with parameters: 0.4 W of output power was applied in contact mode for 10 seconds.

Tetric N Bond Self-Etch was applied using applicator tip on the exposed dentinal surfaces. Excess material was dispersed with air and light cured for 10 seconds. Nanohybrid composite (Tetric N Bond) micro cylinders of 4mm diameter and 5mm height were packed on the occlusal surface with a wire embedded in it and stored in normal saline at room temperature for 24hrs.

Samples thus prepared were subjected to tensile bond strength testing using universal testing machine at a cross head speed of 1mm/min.

STATISTICALANALYSIS

The recorded values were subjected to statistical analysis using the SPSS software. One-way ANOVA and Post-hoc Tukey HSD test were performed to evaluate the tensile bond strength values. $P < 0.05$ was considered to be statistically significant.

RESULT

Table I: Mean tensile bond strength values

TENSILE BOND STRENGTH								
	N	Mean	Std. Deviation	Minimum	Maximum	F	D.f	P
Control	10	10.630	0.676	9.60	11.80	137.636	29	<0.001
Dentrifice	10	5.440	0.851	3.90	6.80			
Laser	10	6.160	0.735	4.50	6.90			
Total	30	7.410	2.446	3.90	11.80			

Table II: Mean difference of tensile bond strength between groups

Dependent Variable: TENSILE BOND STRENGTH						
(I) GROUP	(J) GROUP	Mean Difference (I-J)	Std. Error	P	95% Confidence Interval	
					Lower Bound	Upper Bound
CONTROL	DENTRIFICES	5.1900	0.338	<0.001	4.3496	6.0304
	LASER	4.4700	0.338	<0.001	3.6296	5.3104
DENTRIFICES	CONTROL	-5.1900	0.338	<0.001	-6.0304	-4.3496
	LASER	-0.7200	0.338	0.104	-1.5604	.1204
LASER	CONTROL	-4.4700	0.338	<0.001	-5.3104	-3.6296
	DENTRIFICES	0.7200	0.338	0.104	-.1204	1.5604

Tensile bond strength values are shown in Table I. The one way ANOVA indicated that tensile bond strength values were higher in the control group when compared with the experimental groups. Within the experimental groups the Laser pretreated group showed higher tensile bond strength values.

Mean difference of tensile bond strength in between groups is shown in Table II. Tukey HSD Post Hoc Test showed that there was statistically significant difference when the experimental groups were compared with the control group. But within the experimental groups there is no statistically significant difference.

DISCUSSION

Apart from carious destruction which results in pulpitis or postoperative hypersensitivity, dental pain can be ascribed to dentin hypersensitivity (DH) which is characterized by short, sharp pain originating from exposed dentine in response to stimuli, typically thermal, evaporative, tactile, osmotic, or chemical, and which cannot be ascribed to any other form of dental defect or pathology. Prevalence rates range from 3 to 98 % and therefore the dentine hypersensitivity is one of the main reasons for dental visits.5The most important factor in the etiology of dentine hypersensitivity is exposed dentine as a result of loss of enamel associated with tooth wear, trauma or exposure of root.8 There are various modes of treatment available for dentine hypersensitivity which also include application of desensitizing dentifrice and Lasers. It has been reported that a formulation of bioglass can promote infiltration and remineralization of dentinal tubules. The basic component is silica, which acts as a nucleation site for precipitation of calcium and phosphate. SEM analysis has shown that bioglass application forms an apatite layer, which occludes the dentinal tubules. The use of bioglass in management of DH has been shown by some products such as NovaMin (NovaMin Technology Inc., FL, USA).

Diode lasers can be used as a treatment option for DH. It has become a subject of intensive research in recent times. Low-level laser therapy (LLLT) is a desensitizing method that shows promise. This treatment induces alteration in the neural transmission of the dental pulp, instead of altering the exposed dentinal surface, as in most other types of treatment9.

Since there will be loss of tooth structure associated with dentine hypersensitivity the teeth may require esthetic correction. Desensitizing agents may have an effect on bond strength of composite to dentine.3

In the present study enamel surface was wet abraded to expose the underlying dentine surface in order to simulate clinical scenario. “Tetric N Bond” adhesive was used because it is one of the commonly used bonding agents for both anterior and posterior resin restorations. Specimens were kept in distilled water before testing to simulate the oral conditions.10

Normally the factors which influence the final strength of the union of composite resin to the tooth surface are wettability, stress setup by the setting contraction of the resin, filler composition of composite resin and tensile strength of the material.3 Out of these factors, the role of tensile strength of the material was considered in this study.

In the present study the control group which was not subjected to any of the desensitizing agents showed the highest bond strength and this can be attributed to the availabity of patent dentinal tubules for deeper penetration of resin.

Result of the present study showed that the group treated with Diode laser showed higher bond strength values when compared to the dentifrice pretreated group. It can be due to the fact that diode laser brought about inhibition in nerve stimulation rather than tubule occlusion.

The results of the present study is in accordance with the study done by Makkar S et al in 2018 where higher bond strength values were observed in the specimens which were un treated with any of the desensitizing agents when compared with those pretreated with dentifrice or laser.

The present study is also in accordance with the study done by Arisu HD in 2011 which evaluated the effect of desensitizing agents on the microtensile bond strength of a two-step self-etch adhesive to dentin. The study also concluded that the microtensile bond strength of the control group were significantly higher than the other groups which used desensitizing agents.11

However, further research and development is required in desensitizing methods to find an agent which has negligible effect on bond strength to dentine.

CONCLUSION

Within the limitations of this present study, it can be concluded that dentine untreated with any of the desensitizing agents showed higher bond strength values when compared to dentifrice and Laser pretreated dentine.

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