A COMPARATIVE STUDY OF THE CLINICAL EFFECTIVENESS OF THREE DIFFERENT REGIMENS IN THE TREATMENT OF CERVICAL DENTINAL HYPERSENSITIVITY - AN IN VIVO STUDY

Authors:

1. **Dr. Vidyasagar,MDS**
Senior lecturer,
Department of Conservative Dentistry&Endodontics,
Sri sai dental college,Srikakulam
W.G.DT, Andhra Pradesh, India.

2. **Dr. PadmajaMudunuri, MDS**
Associate Professor,
Department of Conservative Dentistry&Endodontics,
Vishnu Dental College, Bhimavaram-534202
W.G.DT, Andhra Pradesh, India.

3. **Dr.Girija.S.Sajjan, MDS**
Professor & HOD,
Department of Conservative Dentistry&Endodontics,
Vishnu Dental College, Bhimavaram-534202
W.G.DT, Andhra Pradesh, India.

4. **Dr.Vijayalakshmi Bhupathiraju, MDS**
Senior lecturer,
Department of Conservative Dentistry&Endodontics,
Vishnu Dental College, Bhimavaram-534202
W.G.DT, Andhra Pradesh, India.

ABSTRACT

Introduction : *Dentin hypersensitivity is a recurrent condition causing discomfort and sometimes pain to the patient. Though numerous desensitizing agents are available, still the search for a material with long-term effect continues. A recent product Vivasens is supposed to render effective desensitization with synergetic combination of mechanisms.* ***Aim:*** *To evaluate immediate and 12-weeks efficacy of Vivasens with etching and without etching in reducing the cervical dentinal hypersensitivity in comparison with Self etching primer & bonding agent* ***Materials & Methods:*** *30 patients exhibiting three or four quadrants of teeth that were sensitive to touch, cold water and a stream of forced air were enrolled in the study and their responses were recorded on Visual analogue scale (1-10) and verbal rating scale(1-4). Teeth in each subject were randomly categorized into three groups. Group I; Self etching dentine bonding agent,(V generation) Group II; Vivasens with etching, Group III : Vivasens without etching. The teeth were evaluated immediately after the treatment and at the end of 12 weeks.* ***Results:*** *. There was statistically significant difference in all 3 groups, at baseline, immediately, & 3months after topical application of desensitizing agent. Pair wise comparison showed statistically significant result only among Group I & Group II, where as remaining all groups were insignificant to each other.* ***Conclusion:*** *All the agents showed statistically significant reduction in sensitivity compared with baseline. However, when mean values were compared self etching bonding agent was more effective in reducing hypersensitivity followed by Vivasens without etching &Vivasens with etch*

Key words: Dentine hypersensitivity (DH), Self etch dentine bonding agent, Vivasens, Visual analogue scale (VAS), Verbal rating scale (VRS).

INTRODUCTION

The ever-changing profiles of human diseases in mankind's history have not left dentistry untouched. Following the decline of dental caries, other painful dental problems, such as dentine hypersensitivity stepped forward[1.]

Dentinal hypersensitivity is a short and sharp pain arising from exposed dentin, in response to chemical, thermal, tactile, osmotic stimuli and which cannot be ascribed to any other forms of

dental defect or pathology.[2] It is an enigma being frequently encountered but poorly understood[3].

Dentine exposure increases with age, peaking in young adults and then decreasing with age .Abrasion, attrition, erosion and gingival recession contribute to the loss of enamel and cementum[3]. A number of theories have been proposed over the years to explain the pain mechanism of dentinal hypersensitivity. The currently accepted hypothesis is the Hydrodynamic theory proposed byBrannstrom, who stated that dentine hypersensitivity may be caused by movement of the dentinal tubule contents.[4]

Thermal, tactile, chemical and osmotic stimulations cause a painful response if applied to exposed dentine surfaces[5,6]. Therefore, effective treatment of sensitivity requires sealing of the dentine tubules to reduce or inhibit the movement of dentinal fluid.[7,8,9]

The treatment of dentinal hypersensitivity comprises a variety of regimens[2,6,10]. Exposed dentine can be treated with patient-applied (personally applied) dentifrices and dentist-applied (professionally applied) in-office treatments. Most of the treatments involve surface and intra tubular blocking agents to reduce the dentinal permeability. Fluorides in different application form and Self etching bonding agents were widely accepted desensitizing agents. Self etching bonding agents simultaneous etch and prime the dentin. These agents dissolve and convert the smear layer, subsequently penetrate the dentinal tubules and immediately begin complete sealing and desensitization[4,5] .However the efficacy of bonding agent decreases over time[11].

A recent product VivaSens(IvoclarVivadent) reduces hypersensitivity of dentin by sealing the dentinal tubules. The blockage of the tubuli is accomplished on one hand by precipitating proteins and calcium ions out of the dentin liquor and on the other hand, by co-precipitating polyethylene glycol dimethacrylate (PEG-DMA) that is contained in the desensitizer.[12,13,14,15,16.]

Studies conducted on Vivasens to evaluate the effect of etching on the sealing of dentinal tubules revealed sealing of etched dentinal tubules at a greater depth. This data suggested that on application of Vivasens after etching in vivo should still result in superior function of the desensitizer.[12]

Because cervical dentine hyper sensitivity is impossible to test in vitro , clinical trails of safety and both immediate & long term efficacy of desensitizing treatments are required.

Hence the purpose of this study was to evaluate immediate and 12-week efficacy of Vivasens with etching and without etching in reducing the cervical dentinal hypersensitivity in comparison with Self etching primer & bonding agent. The null hypothesis tested was that Vivasens with different application modes was not superior in obtaining desensitization.

MATERIALS & METHODOLOGY

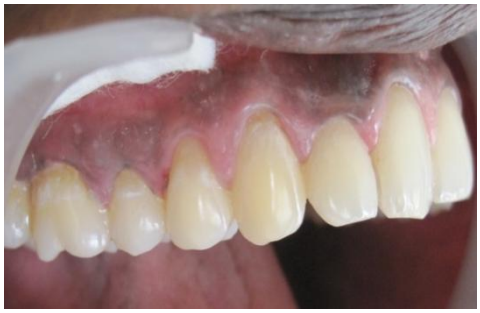
The study was a single-centered, concurrent parallel treatment group design to compare the efficacy of two topical desensitizing agents with variable application strategies in the treatment of dentine hypersensitivity.

The research protocol was approved by the research committee of NTR UNIVERSITY OF HEALTH SCIENCES. The subjects were selected from the pool of the patients referred to the Department of Conservative Dentistry & Endodontics of Vishnu Dental College.

An informed consent of all subjects who participated in this clinical investigation was obtained after the possible discomforts, risks and procedures were fully explained.

The study population consisted of 30 patients in good general health, aged 18 to 59 years, with the mean age being 38 years. Detailed clinical and radiographic investigations were performed on all patients to exclude conditions of teeth, which might have caused pain similar to dentine hypersensitivity.

The Subjects in whom dentine hypersensitivity was elicited in atleast three teeth in different quadrants as a recurrent, short, sharp pain arising from the buccal cervical margin of teeth in response to stimuliespecially to cold were included in the study.



Pregnant, breast feeding women, those under anti-depressive regimen,patients undergoing orthodontic and periodontal therapy were excluded from this study. Exclusion criteria also included extensively restored and crowned teeth extending into the test area and if the teeth were used as abutments for fixed or removable prosthesis.

The tooth to be tested was isolated using cotton rolls and the 3 stimulus tests were performed in order, with the least painful, that is, tactile test first, followed by the air blast and finally the cold water test.

Each of these tests was performed with an interval of 5 min separating them.

- Tactile test: William's periodontal probe was gently run across the affected surface of the tooth
- Air blast test: A blast of air at a pressure of 45–60 psi from a 3-way dental syringe for 1second
- Cold water test: Ice cold water in a disposable 2-cc syringe was slowly expelled onto the tooth surface

For all stimuli tests, patient response was recorded on the following verbal rating scale (VRS)

0= no significant discomfort, or awareness of stimulus

1= discomfort, but no severe pain.

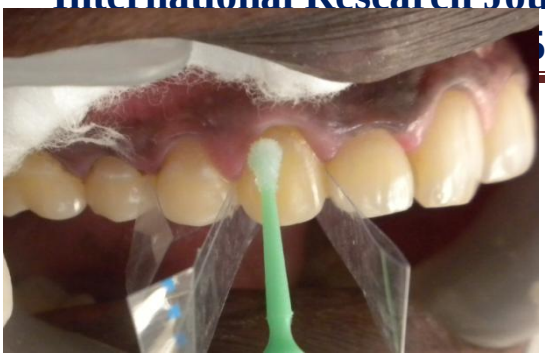
2= severe pain during application of stimulus.

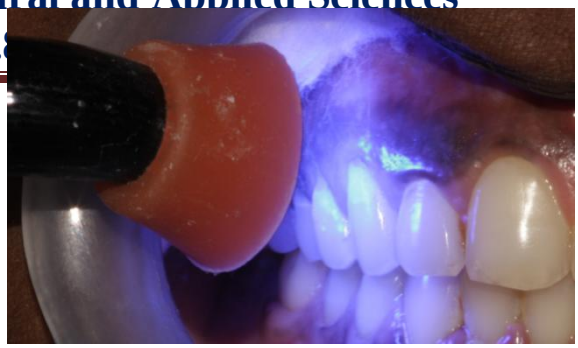
3= severe pain during and after application of stimulus.

Finally, the patients were requested to grade their overall sensitivity using a 10 cm Visual Analogue Scale (VAS) labeled at the extremes with "no pain," at the zero cm end of the scale, and "severe pain," at the 10 cm end of the scale.

Presented sensitive teeth in an individual were categorized into three groups. Prophylaxis of teeth was done. Test materials were be applied randomly as follows.

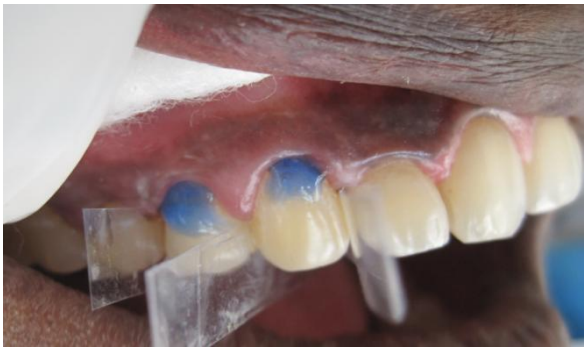
Group 1:Self etching dentine bonding agent (Vgeneration): Self etching primer &bond (3M ESPE)was applied and then cured for a period of 20seconds.





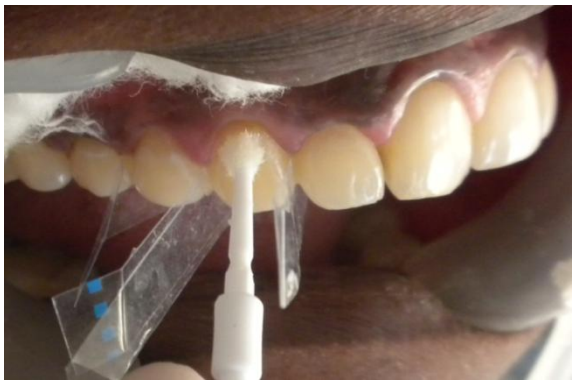
GROUP 2: VIVASENS WITH ETCHING

The tooth was isolated, dried, and acid etching was performed. One drop of Vivasens was dispensed onto the paper pad and thoroughly mixed with microbrush , applied onto the etched cervical abrasion for 60 seconds and dried for 10seconds.



GROUP 3: VIVASENS WITHOUT ETCHING

Vivasenswas applied onto the un-etched cervical abrasion for 60 seconds and dried for 10seconds. Patients were advised not to eat, drink or brush their teeth for at least 30 minutes following treatment



Then sensitivity measurements were recorded at baseline, immediately 24 hours after treatment& at 3months interval after stimulus application, using VAS and verbal rating scale (VRS).

RESULTS

Total number of 30 patients participated in this study. The scores of Visual analogue scale (VAS)& Verbal rating scale (VRS) of each group were analyzed at different time periods using Friedman test .Then, pair wise comparisons among three test groups were analyzed with the Mann-Whitney U test. The significance level of this study was set at 0.05.

On comparing the three methods of desensitizing treatments used in this current study, there was statistical significant difference found only among Self etching bonding agent group and Vivasens with etching group.

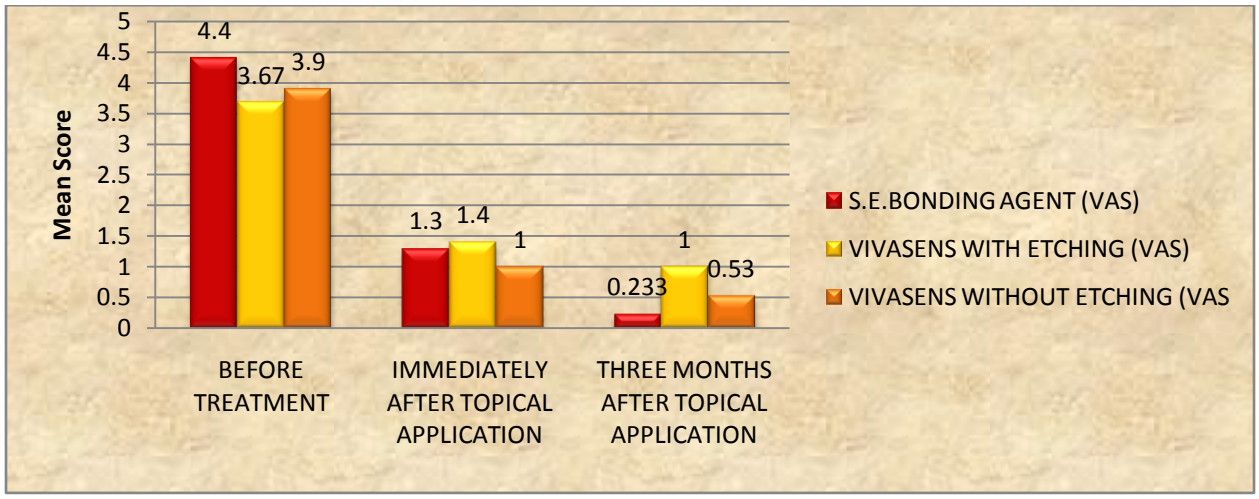
When individual treatment was considered separately statistically significant differences were observed between the groups prior to the application, immediately and three months after topical application of desensitizer in all the groups.

To quantify & evaluate the degree of hypersensitivity experienced in all subjects two scales were used :Visual analogue scale(VAS) &Verbal rating scale(VRS).

Results showed that on comparision of Group I with Group II, immediately after the desensitization, there was no statistically significant difference with p value being 0.834, but after 3 months statistically significant difference was found as P value is 0.001. Result showed that at 3months recall period, self etch adhesive group effectively reduce the DH, when compared with the Vivasens with etching group.

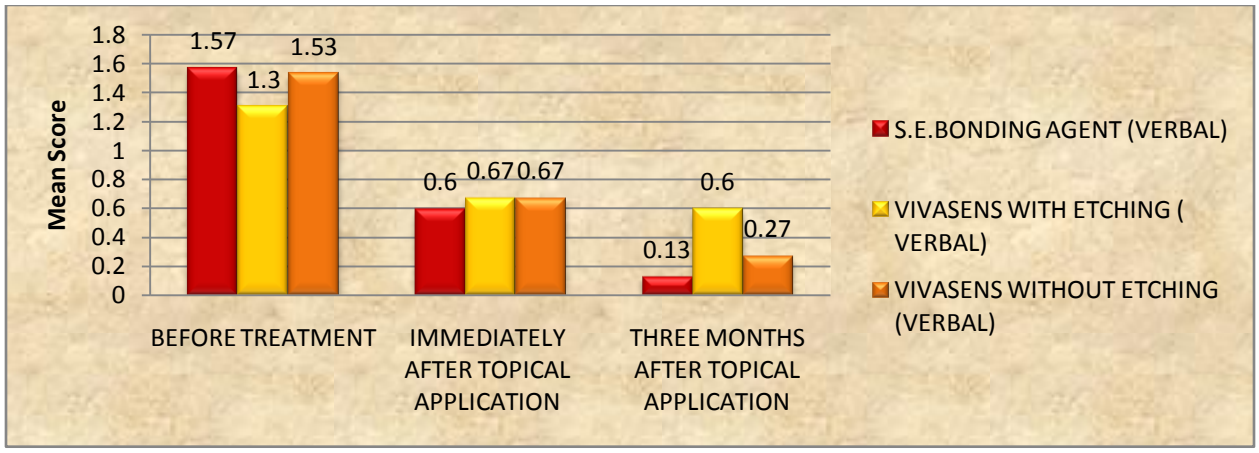
Comparing of group I with group III, immediately & 3months after topical desensitization ,there was no statistically significant difference in VAS.

VISUAL ANALOG SCALE (VAS) RESULTS



Graph 1 Shows statistical significant difference between S.E. Bonding agent and Vivasens with and without etching group on comparing before treatment, immediately and 3months after topical application on VAS

VERBAL RATING SCALE (VRS) RESULTS



Graph 2 Shows statistical significant difference between S.E. Bonding agent and Vivasens with and without etching group on comparing before treatment, immediately and 3months after topical application on VRS.

DISCUSSION

Dentin hypersensitivity is one of the most common painful conditions affecting oral comfort and function. Dentine hypersensitivity lesions can be localized through dentine exposure by the effects of excessive tooth brushing and gingival recession, by erosion alone, or by combined erosion/abrasion.[2,10,17]

Studies conducted with a scanning electron microscope showed that the orifices of many dentinal tubules were open in sensitive areas, while they were occluded by crystals in naturally desensitized areas on the same root surface.[7,18,19]Therefore, effective treatment of sensitivity requires sealing of the dentine tubules to reduce or inhibit the movement of dentinal fluid.

Though there are many professionally applied topical desensitizing agents available in the market, each one of these have their share of merits & demerits in providing effective treatment.

In this present study, three concurrent parallel treatment groups were designed to compare the efficacy of two topical desensitizing agents (Vivasens, self etching dentine bonding agent) with variable application strategies in the treatment of dentine hypersensitivity. These agents desensitized the sensitive dentine by tubule blocking mechanism.

30 patientswith a mean age group of 38 years exhibiting three or four quadrants of teeth that were sensitive to touch, cold water and to a stream of forced air were enrolled in this study.Three different treatment strategies with two different agents (S. E. bonding agent, Vivasens) were applied topically to the sensitive teeth in same patient of different quadrants and were divided into three groups. Group I ; Desensitization with S.E . bonding agent, Group II; Desensitization with Vivasens with etching, Group III; Desensitization with Vivasens without etching.

Out of the 30 patients majority of them were female. It was known that females tend to be affected with DH more often than males. The higher prevalence of DH in this gender might be connected to excessive oral hygiene habits, such as aggressive tooth brushing[15,20].

To quantify & evaluate the degree of hypersensitivity experienced in all subjects, subjective feedback of tactile, evaporative and thermal stimuli were translated into

objective data using VAS[18,46] (a 1-10 scale, where 1=mild and 10=intolerable), and VRS (a 1-4 scale, which were the most appropriate methods to evaluate & diagnose pain levels)[18].For evaluation of the treatment for DH ,each treated patient was evaluated before treatment, immediately & 3months after topical desensitization .

When individual treatment groups were analyzed with the Friedman test, a statistically significant ($p<0.05$) difference was found among the three test groups at different time intervals, that is the prior to the application, immediately and three months after topical application. It has been hypothesized that all agents of this study show the desensitizing effects via blocking the dentin tubules; whereas, their active ingredients are different from each other. However, these agents presented similar effects for reducing DH.

Many studies were conducted to evaluate the efficacy of various commercially available products likeVivasens, Seal& protect, Bisblock, in treatment of DH, which revealed that the relieving effect was similar to the other desensitizing agents that block the tubules. There was no statistically significant difference found.[13,20]

Sealing of the dentinal tubules by Vivasens was investigated using confocal laser microscope. The results indicated that sealing of dentine was also possible using etched dentine, but occurred at greater depth rather than surface[12,20].

These data suggested that an application of Vivasens after etching should still result in proper function of desensitizing. However in our study, the group treated with Vivasens alone showed better results, though it was not statistically significant.The probable reason could be the greater demineralization associated with etching might not have been sealed by the precipitate of Vivasens. This requires further investigations & long term clinical trials also.

Since it is a new product, studies are indicated for evaluation of mechanism of action of Vivasens. Studies are also recommended to compare the efficacy of this product with newer desensisitizing agents in the market. The long-term effectiveness of the Vivasens needs to be evaluated to test the longevity of its performances and amount of time until DH reoccurs after treatment.

CONCLUSION

The following conclusions have been drawn from this study:

When individual treatment groups (self etching bonding agent group, Vivasens with etching ,Vivasens without etching) were statistically analyzed, a statistically significant ($p<0.05$) difference was found at different time intervals, that is at baseline, immediately and three months after topical application. However, when mean values were compared, Self etching bonding agent was more effective in reducing hypersensitivity followed by Vivasens without etching &Vivasens with etching.

Results showed that on comparision of Group I with Group II, immediately after the desensitization, there was no statistically significant difference with p value being 0.834, but after 3 months statistically significant difference was found as P value is 0.001. Result showed that at 3months recall period, self etch adhesive group effectively reduce the DH, when compared with the Vivasens with etching group.

Comparing of group I with group III, immediately & 3months after topical desensitization ,there was no statistically significant difference in VAS. However there was no statistically significant difference found in the pair wise comparison among all the three groups. But there was stastically significant results found among self etch bonding agent group versus Vivasens with etching group. So the null hypothesis was accepted.

So this study concludes that the Vivasens a new formulation for dentine hypersensitivity, effectively reduced the cervical dentinal hypersensitivity.

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