



Original Research Article

Evaluation and Comparison of Desensitizing Potential of Novamin Containing Dentifrice and Gallium Aluminum Arsenide Diode Laser (GaAlAs) in the Treatment of Dentinal Hypersensitivity

Rajeshwari H. R^{1*}, Suchetha A^{2**}, Prajakta V Phadke^{3**}, Koduru Sravani^{3**}, Sapna N^{4**}, Divya Bhat^{5**}

¹Lecturer, ²Prof. and Head, ³Post Graduate, ⁴Reader, ⁵Senior Lecturer,

*Dept. of Periodontology, KLE V K Institute of Dental Sciences, Belagavi, Karnataka.

**Dept. of Periodontology, D. A. P. M. R. V. Dental College, J. P. Nagar I phase, Bangalore.

Corresponding Author: Koduru Sravani

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ABSTRACT

Dentine hypersensitivity is a pain caused by a change in fluid flow in the dentinal tubules, which in turn excites the nerve endings located at the pulp-dentine border. Exposed dentine is a result of enamel loss or gingival recession in combination with cementum loss. The present study aimed to evaluate and compare the desensitizing potential of novamin containing dentifrice and Gallium Aluminum Arsenide Diode Laser (GaAlAs) in the treatment of dentinal hypersensitivity. Forty Subjects with age group between 25-55 years with complaint of hypersensitivity to thermal, mechanical, sour stimulus were included in the study. DH was assessed using verbal rating scale. {VRS scores: 0 - No discomfort, 1 - Mild discomfort, 2 - Moderate discomfort, 3 - Severe pain only during application of stimulus and 4 - Severe pain persisting after removal of stimulus}. Subjects who showed score of two or more were included. Subject with dental caries, broken teeth, any chronic systemic disease/cardiac pacemakers were excluded. Subjects were divided into Group1 (n=20) Laser group, Group 2 (n=20) novamin group. DH was scored before initiating the treatment modalities, immediately after the treatment, one week and one month post operatively. Scores were subjected to Mann-Whitney and Wilcoxon Signed Ranks test. Results from the study showed that both novamin containing dentifrice and diode laser were effective in reducing dentin hypersensitivity.

Keywords: Novamin, dentinal hypersensitivity, diode laser.

INTRODUCTION

Dentine sensitivity (DS) is a “pain arising from exposed dentine in response to stimuli, typically thermal, evaporative, tactile, osmotic or chemical, which cannot be ascribed to any other form of dental defect or pathology”.^[1,2]

Under physiological condition, dentin is well protected by enamel or cementum casing and is not affected by any

stimuli.^[3] The dentine hypersensitivity occurs as a result of exposed dentin and the most common causators are abrasion, due to aggressive tooth brushing; abfraction, caused by tooth flexion as a result of ill-directed occlusal forces or occlusal disequilibrium; erosion, as an effect of ingestion of acid in the diet and gingival recession associated with loss of periodontal support etc.^[4]

Hypersensitivity is becoming more prevalent with increased number of teeth with gingival recession, erosion and attrition. This condition may disturb the patient routine habits of eating, drinking and brushing. Considerable research has been conducted on understanding the mechanism of DS and on development of effective treatments to alleviate and prevent this painful condition. [5]

Various therapeutics rationales have led to different treatment modalities. These include nerve depolarization, [6] (topical potassium nitrate), protein binding and calcium compound deposition within tubules; (amorphous calcium phosphate), [7] increased peritubular mineral deposition; (topical glucocorticoid therapy), iontophoresis [8] and photobiomodulation (Laser desensitization). [9]

Calcium sodium phosphosilicate (Sensodyne repair®) is a bioactive glass that was originally developed as bone-regenerative materials. These materials when exposed to body fluids become active and deposit hydroxycarbonate apatite (HCA), thus when incorporated into a dentifrice, Novamin particles are deposited onto dentin surfaces and mechanically occlude tubules. [10]

With the advent of laser technology and its growing utilization in dentistry, an additional therapeutic option is available for the treatment of dentinal pain. The laser, by interacting with the tissue, causes different tissue reactions, according to its active medium, wavelength and power density and to the optical properties of the target tissue. The laser interaction with the dental pulp causes a photo biomodulating effect, increasing the cellular metabolic activity of the odontoblasts and obliterating the dentinal tubules with the intensification of tertiary dentine production. [11]

The purpose of the present study was to compare the effects of novamin

containing dentifrice and Gallium aluminium arsenide diode laser in the treatment of dentinal hypersensitivity.

MATERIALS AND METHODS

Outpatients visiting the Department of Periodontics, D.A.P.M.R.V Dental College, Bangalore, with chief complaint of dentinal hypersensitivity were included in the study. Ethical clearance was obtained from the institution and written consent was obtained from subjects. Subjects of age between 20 and 55 years with dentinal hypersensitivity to thermal, mechanical, sweet or sour stimulus, who showed scores of two or more in verbal rating scale were recruited for the study.

Oral examination was carried out on patients to diagnose the hypersensitive teeth using 1) Cold water 2) Air blast test. [12]

- 1) Cold water test: Ice-cold water was poured on the suspected isolated tooth surface drop by drop using disposable syringe.
- 2) Air blast test: A blast of air was directed on the isolated tooth for one second keeping the nozzle tip of air syringe about 1 - 2 cm away.

Dentinal hypersensitivity was then assessed using verbal rating scale VRS (Verbal Rating Scale) scores: 0 - No discomfort, 1 - Mild discomfort, 2 - Moderate discomfort, 3 - Severe pain only during application of stimulus, 4 - Severe pain persisting after removal of stimulus. [8] Subjects showing a discomfort score of two or more were included in the study. These scores were designated as pre-treatment scores (table I). Dentinal hypersensitivity was assessed and scored at one week and one month (table II and III)

Subjects with systemic conditions that would contraindicate the use of iontophoresis, patients with fractured tooth, dental caries, large restoration, history of periodontal treatment in last six months or

patient on desensitizing therapy were excluded.

MATERIALS: Novamin containing dentifrice (sensodyne repair[®]), Diode laser with 980 wavelength, 320 micrometer optic fiber.

STUDY DESIGN: Total of forty patients (18male and 22 female) were included for the study after considering inclusion and exclusion criteria. Scaling and polishing of the whole mouth was done at day 0 and 7 before initiating desensitizing therapy.

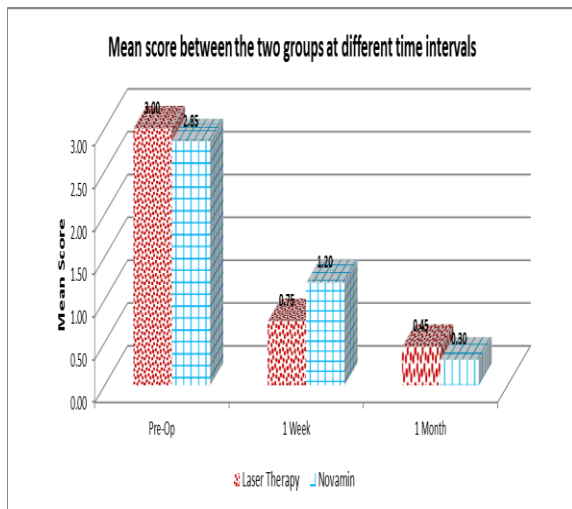
Subjects were randomly divided into two groups based on coin toss method. Group A: Laser group, group B: Novamin group.

Group A: lased by GaAlAs laser (Sirona soft tissue diode laser) of 980nm wavelength with the following parameters 0.5W in PW(T on 100ms and T off 100ms) in no contact mode and using a fibre of 320-micron diameter. Patients received up to 3 application of 1 minute each week. (Figure 1)

treatment modalities, immediately after the treatment, one week and one month post-operative. Laser treatment was repeated after one week in those patients with persistent dentinal hypersensitivity with verbal score of 2 or more.



Figure 1: GaAlAs Diode Laser



Group B: Subjects were asked to apply novamin containing dentifrice on all the affected teeth surfaces and wait for 2-3 minutes and then brush for 2 minutes, twice daily. (Figure 2)

Dentinal hypersensitivity was checked and scores were recorded before initiating the

Statistical Analysis: Inter group scores were compared using Mann-Whitney test and intra-group comparison at different time intervals was done using Wilcoxon Signed Ranks Test.

RESULTS

Scores were subjected to Mann-Whitney and Wilcoxon Signed Ranks test. (Both intergroup and intragroup comparison was done). Immediate, one week and one month post-operative scores were compared with the preoperative verbal rating scores.

Intragroup (Laser): Comparison of scores between pre-op, immediate, one week and one month postoperative within Laser group showed reduction in dentinal hypersensitivity which was found to be statistically significant from pre-op to Immediate post-op ($P < 0.001$), Pre-op to 1 Week ($P < 0.001$) as well as from Pre-op to 1 Month ($P < 0.001$). (table-4)

Intragroup (Novamin): Comparison of scores between pre-op and one week , one month post-operative within Novamin group showed reduction in dentinal hypersensitivity which was found to be statistically significant from Pre-op to one week post-op ($P<0.001$) as well as from Pre-op to 1 Month ($P<0.001$). (table-5)

Intergroup (Novamin Versus Laser): Both Laser and novamin treatment reduced dentinal hypersensitivity effectively. However the difference in mean score between Laser and Novamin was not statistically significant at ($P>0.05$) (table-6)

Table 1: Distribution of scores in Laser Therapy and Novamin: pre-op

Pre-Op	Laser Therapy (N=20)		Novamin (N=20)	
	N	%	n	%
No Discomfort	0	0%	0	0%
Mild Discomfort	0	0%	0	0%
Moderate Discomfort	3	15%	3	15%
Severe Pain only during application of stimulus	14	70%	17	85%
Severe Pain persisting after removal of stimulus	3	15%	0	0%

Table 2: Distribution of scores in Laser Therapy and Novamin: one week post op

1 Week	Laser Therapy (N=20)		Novamin (N=20)	
	N	%	n	%
No Discomfort	9	45%	4	20%
Mild Discomfort	7	35%	8	40%
Moderate Discomfort	4	20%	8	40%
Severe Pain only during application of stimulus	0	0%	0	0%
Severe Pain persisting after removal of stimulus	0	0%	0	0%

Table 3: Distribution of scores in Laser Therapy and Novamin: one month post-op

1 Month	Laser Therapy (N=20)		Novamin (N=20)	
	N	%	n	%
No Discomfort	15	75%	15	75%
Mild Discomfort	1	5%	4	20%
Moderate Discomfort	4	20%	1	5%
Severe Pain only during application of stimulus	0	0%	0	0%
Severe Pain persisting after removal of stimulus	0	0%	0	0%

Table 4: Comparison of scores between pre-op and other time intervals within Laser Therapy group: (Wilcoxon Signed Ranks Test)

Time Interval	Mean	Std Dev	SE of Mean	Mean Difference	Z	P-Value
Pre-Op	3.00	0.56	0.13	1.850	-3.981	<0.001*
Immediately after Post-Op	1.15	0.93	0.21			
Pre-Op	3.00	0.56	0.13	2.250	-4.029	<0.001*
1 Week	0.75	0.79	0.18			
Pre-Op	3.00	0.56	0.13	2.550	-4.010	<0.001*
1 Month	0.45	0.83	0.18			

*denotes significant difference

The reduction in mean score was found to be statistically significant from Pre-op to Immediately after post-op ($P<0.001$), Pre-op to 1 Week ($P<0.001$) as well as from Pre-op to 1 Month ($P<0.001$).

Table 5: Comparison of scores between pre-op and other time intervals within Novamin group: (Wilcoxon Signed Ranks Test)

Time Interval	Mean	Std Dev	SE of Mean	Mean Difference	Z	P-Value
Pre-Op	2.85	0.37	0.08	1.65	-3.999	<0.001*
1 Week	1.20	0.77	0.17			
Pre-Op	2.85	0.37	0.08	2.55	-4.042	<0.001*
1 Month	0.30	0.57	0.13			

*denotes significant difference

The reduction in mean score was found to be statistically significant from Pre-op to Immediately after post-op ($P<0.001$) as well as from Pre-op to 1 Month ($P<0.001$).

Table 6 : Comparison between Laser Therapy and Novamin at different time intervals

Time Interval	Group	Mean	Std Dev	SE of Mean	Mean Difference	Z	P-Value
Pre-Op	Laser Therapy	3.00	0.56	0.13	0.150	-0.947	0.344
	Novamin	2.85	0.37	0.08			
1 Week	Laser Therapy	0.75	0.79	0.18	-0.450	-1.781	0.075
	Novamin	1.20	0.77	0.17			
1 Month	Laser Therapy	0.45	0.83	0.18	0.150	-0.268	0.789
	Novamin	0.30	0.57	0.13			

No significant difference was observed between the two groups at any of the time intervals ($P>0.05$).



Figure 2: Novamin

DISCUSSION

Dentinal hypersensitivity is common clinical condition presenting problems to both the patient and dentist and is reported to be relatively widely prevalent. Various therapeutics rationales have led to different clinically proven treatment modalities. [13] In light of the hydrodynamic theory, many of the treatment modalities aim to reduce sensitivity by blocking the dentinal tubules. [14]

Various therapeutic agents and treatment modalities are available such as, calcium sodium phosphosilicate (Novamin®), strontium chloride, potassium nitrate, potassium oxalate, hydroxyapatite, sodium fluoride, laser and iontophoresis that have been proposed to reduce sensitivity. [15]

Laser therapy was first introduced as a potential method for treating dentinal hypersensitivity in 1985. [16] Since then, many studies have been done on laser applications for dentine hypersensitivity treatment and much information has been gathered.

Recent clinical evaluation has shown that a novel bioglass dentifrice named Novamin was effective at reducing dentinal hypersensitivity. [17] Active ingredient of

Novamin is bioactive glass that was originally developed as a bone regenerative material. Bioactive glasses have been shown to promote the crystallization of new mineral on their surfaces. [18]

Treatment for dentinal hypersensitivity can be broadly classified as home and office methods. Novamin containing dentifrice comes under the category of home remedies and laser under office methods. Few cases of dentinal hypersensitivity may resolve with desensitizing dentifrices, few with office methods like Laser and further some cases may require the combination of home and office method treatment modalities.

Hence present study was conducted to evaluate the ability of two different treatment modalities in reduction of dentin hypersensitivity. Results showed that both laser and novamin treatment reduced dentinal hypersensitivity effectively. However, the difference in mean score between Laser and Novamin was not statistically significant at ($P>0.05$).

Intragroup group comparison (both laser and novamin) showed statistical significant reduction in dentinal

hypersensitivity from pre-op to immediate, one week and one month post-op.

Matsumoto *et al.* [19] and Yamaguchi *et al.* [20] have reported decrease in hypersensitivity by 85% and 60% respectively in teeth treated with laser. In a recent randomized clinical trial, novamin was compared with potassium nitrate and a placebo. The novamin group was found to be significantly better in reducing the VAS score compared to the potassium nitrate group and the placebo group. [21]

CONCLUSION

Results of our study indicated that both novamin and laser were effective in reducing dentinal hypersensitivity. However the difference in mean score between novamin and laser was not statistically significant at Pre-Operative and 1 Month. Present study was a short term study with small sample size. Hence studies incorporating larger sample sizes with long term follow up are essential to further validate our findings.

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