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To Evaluate the Efficacy of Fluoride Varnish, Diode Laser and their Combination in the Treatment of Dentin Hypersensitivity: A Randomized Clinical Study

Dr. Gunjan Jadav[1]*, Dr. Ashish Kaur[2], Dr. Jinay Sathwara[3], Dr. Jubin Thacker[4], Dr. Kinjal Savjani[5], Dr. Archana Prajapati[6]

[1]PG Student, Department of Periodontology, AMC Dental College Ahmedabad, Gujarat, India

[2]Readerand PG Guide, Department of Periodontology, AMC Dental College, Ahmedabad, Gujarat, India

[3]Reader, Department of Periodontology, AMC Dental College, Ahmedabad, Gujarat, India

[4]PG Student, Department of Periodontology, AMC Dental College, Ahmedabad, Gujarat, India

[5]PG Student, Department of Periodontology, AMC Dental College, Ahmedabad, Gujarat, India

[6]PGStudent, Department of Periodontology, AMC Dental College, Ahmedabad, Gujarat, India

Abstract: ***Background: Dentin hypersensitivity is a prevalent oral problem affecting the oral health quality of life of the adult population. Patients with periodontal diseases and faulty tooth brushing technique are particularly at a higher risk of root surface exposure due to recession and cervical abrasion which may lead to dentin hypersensitivity. Aim: The aim of the study was to evaluate the efficacy of fluoride varnish (sodium fluoride [NaF]), diode laser, and the combination of both in the treatment of dentin hypersensitivity. Materials and Methods: Thirty patients aged 20–60 years suffering from dentin hypersensitivity to air - blast, cold, and tactile stimulation corresponding to score 4 and above on the Visual Analog Scale (VAS) in three quadrants with hypersensitive teeth. were selected. Hypersensitive teeth were allotted to Group 1 – 5% NaF varnish application alone, Group 2 – 980 - nm gallium–aluminum–arsenide laser (GaAlAs) diode laser (0.5 W) irradiation alone, and Group 3 – NaF varnish application, followed by diode laser irradiation. VAS score was recorded at baseline, immediate post op, 1 week, 1 month, 3 months. Results: A statistically significant reduction in dentin hypersensitivity was observed in all the three groups, from the baseline to 3 months follow - ups (P < 0.05). Group 2 and Group 3 demonstrated a significantly higher reduction (P < 0.05) in dentin hypersensitivity for all the stimuli as compared to Group 1 at all follow - up intervals. However, statistically significant difference (P< 0.05) was also present between Group 2 and Group 3 at all follow - ups. Conclusion: Sodium fluoride varnish followed by Diode laser application is significantly more effective than fluoride varnish alone and/or diode laser alone in the treatment of dentin hypersensitivity.***

Keywords: Hypersensitivity, Recession, GIC, Varnish, Laser

1. Introduction

Dentinal hypersensitivity (DHS) is a commonly occurring dental condition that was initially reported by Blum in 1530. [1]Dentinal Hypersensitivity is a “short, sharp pain arising from exposed dentin in response to stimuli, typically thermal, evaporative, tactile, osmotic, orchemical, which cannot be ascribed to any other form of dental defect orpathology”. [2]

The major etiological factor are attrition, poor endo treatment, faulty tooth brushing,, gingival recession, periodontal disease etc. [3]Many treatment modalities that obliterate the dentinal tubules are available; however, till date, no consensus regarding the most efficient method for treating dentin hypersensitivity has been published. [4] Currently different treatment modalities are used to treat dentinal hypersensitivity i. e., in office treatment and at home treatment. The various treatment modalities range from non - invasive to minimally invasive i. e., GIC restoration, dentin bonding agents, varnish application to surgical interventions like free gingival graft, connective tissue graft etc to newer advances like lasers in treatment of dentin hypersensitivity. [4]

The present study combines both treatment modalities, conventional treatment as well as newer advances i. e., sodium fluoride varnish application followed by diode laser application to combine the effect of both for treating dentin hypersensitivity and to come up with new treatment option.

Therefore, aim of the study was to evaluate the efficacy of fluoride varnish (sodium fluoride [NaF]), diode laser, and the combination of both in the treatment of dentin hypersensitivity immediately post op, at the end of 1 week, 1 month and 3 months.

2. Material and methods

Systematically healthy patients aged between 20 - 60 years, with gingival recession ≥ 3mm and who were willing to provide informed consent, can come for regular follow up and presence of a teeth, hypersensitive to tactile, cold, or air stimulation in three different quadrants, corresponding to score 4 or above on the Visual Analogue Scale (VAS) were included in the study.

Patients who had received any professional treatment with desensitizing agents or periodontal treatment during the past 6 months, pregnant or lactating women, teeth having carious lesions, extensive restorations, ongoing endodontic

treatment, deep cervical lesions, and teeth diagnosed to have cracked tooth syndrome, vertical fracture, and pulpitis and a patient having a history of smoking were excluded from the study.

Prior to the study, the purpose was explained to the patients and a written informed consent was obtained from patients participating in the study. A total of 30 patients with 90 sites were identified, and a special performa was designed for recording of all the observations.

Prophylactic scaling and root planning was performed with hand and/or ultrasonic scalers followed by oral hygiene instructions i. e., use of appropriate toothbrush and dentifrices with proper tooth brushing technique.

Recording of Clinical parameters:
VAS score for each stimulus was recorded before treatment session. The following three stimuli were used for the assessment of dentin hypersensitivity with a 5 - min gap between each stimulus.

Air - blast stimulus: Three - way syringe attached to the dental chair was used, keeping a distance of 1 cm, perpendicular to the exposed root surface for 3 seconds per tooth and VAS score was recorded.

Cold stimulus: After isolating the hypersensitive tooth, 0.5 ml of the water was expelled from the syringe on the exposed root surface with a 2 - ml disposable syringe with needle (24 gauze) which was filled with freshly melted ice - cold water and VAS score was recorded.

Tactile stimulus: The University of North Carolina - 15 probe (UNC - 15) tip was moved in mesio - distal direction in contact with the exposed root surface of the tooth and VAS score was recorded. [4]

After recording the baseline dentin hypersensitivity scores, hypersensitive teeth in different quadrants were randomly assigned to one of the three treatment groups:

In group 1: The hypersensitive tooth was first isolated with a cotton roll. After which, 5% sodium fluoride varnish (Varnish containing 50 - mg NaF equivalent to 22, 600 ppm of fluoride) was applied on the exposed root surface for 2 min, with the help of a disposable applicator tip.

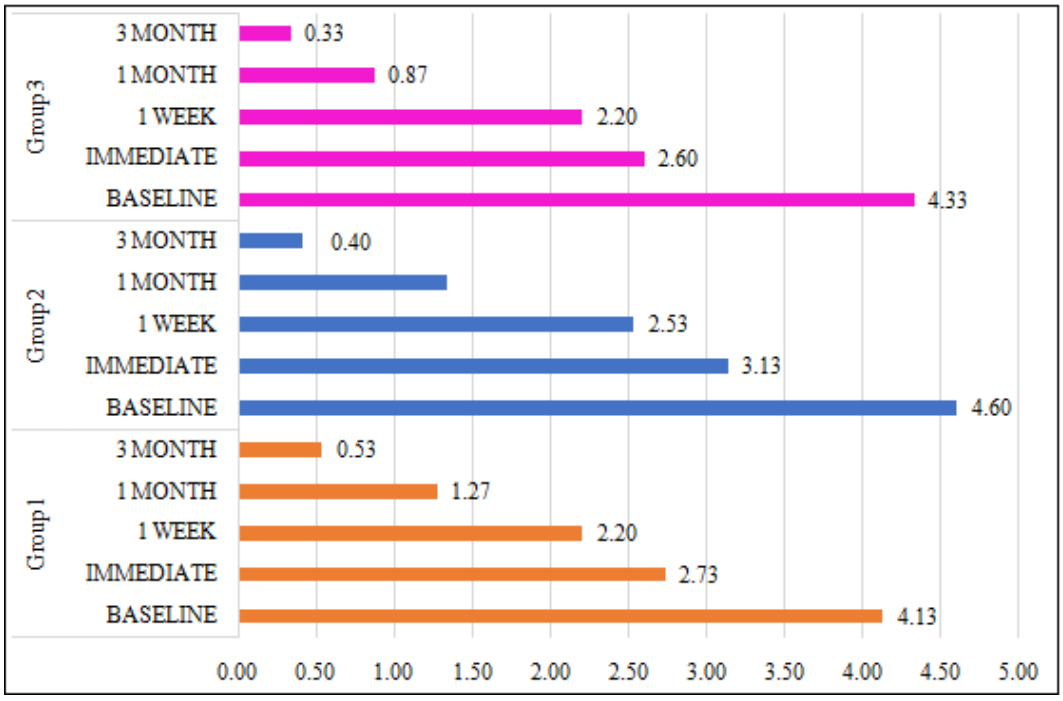
In group 2: Hypersensitive tooth in the selected site was irradiated using diode laser: 940 nm (Biolase), power 0.5 W continuous emission form. The tooth was irradiated for 2 min in noncontact mode with the laser beam directed perpendicular to the exposed root surface of the tooth as close as possible without touching the tooth surface.

In group 3: Hypersensitive tooth in the selected sites was first treated by application of fluoride varnish for 2 min. After an interval of 5 minutes, irradiation treatment using 940 - nm diode laser (Biolase), power 0.5 W continuous emission form, the tooth was irradiated for 2 min in noncontact mode with the laser beam directed perpendicular to the exposed root surface of the tooth as close as possible but without touching the tooth surface.

All patients were instructed not to eat and drink for 1 hour and to resume toothbrushing after 12 hours.

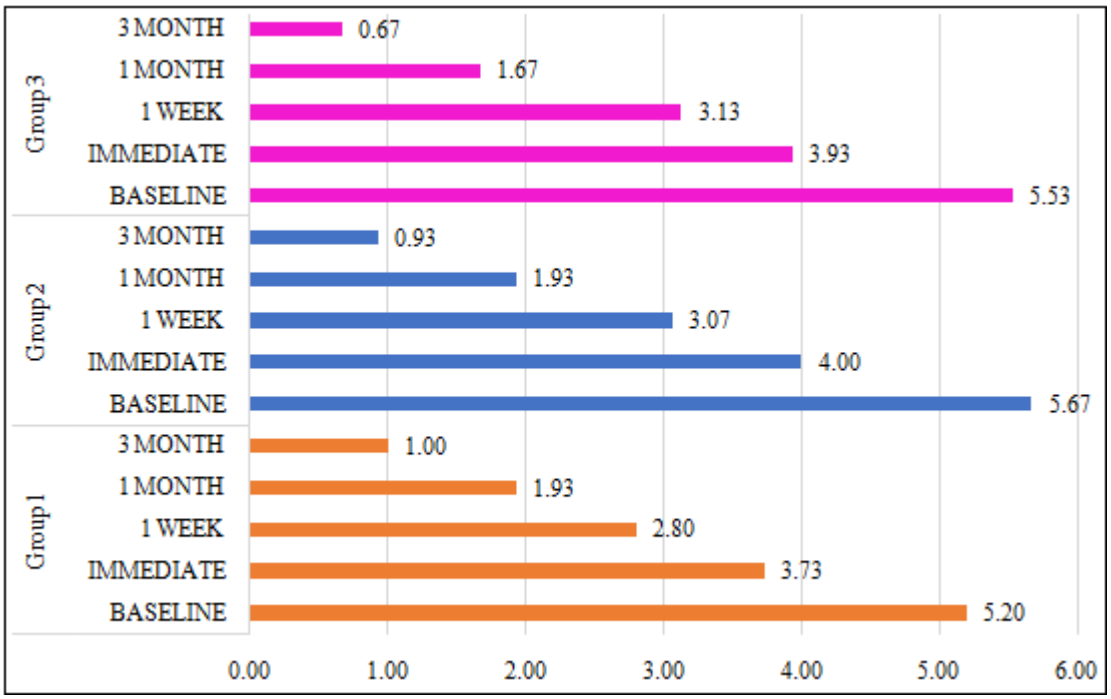
Statistical Method
Data was collected & compiled into excel sheet and analysis was done using appropriate statistical software. Descriptive and Inferential statistical analysis was carried out. For intragroup comparison, Wilcoxon signed rank test was used, and for intergroup comparison Mann - Whitney U test was used.

3. Results



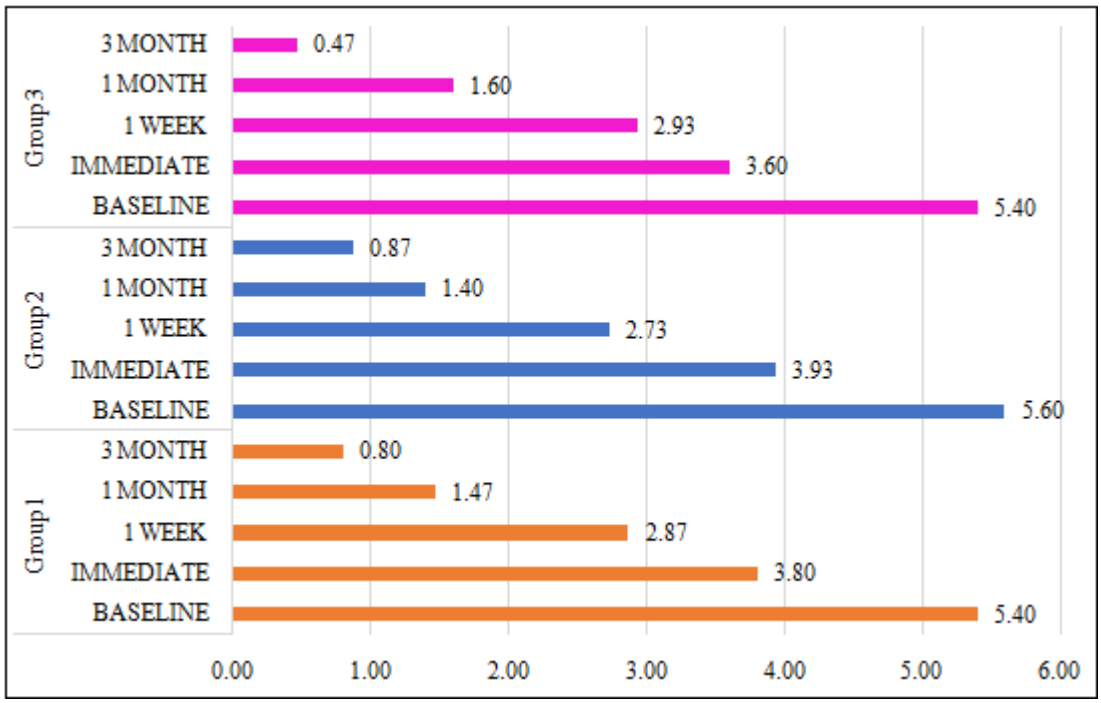
Graph 1: The graph shows the difference in response by tactile stimulus between the three groups

In group 1, a reduction in hypersensitivity recorded was **87.17%**, and in group 2 the reduction in hypersensitivity recorded was **91.31%** and in group 3the reduction in hypersensitivity recorded was **92.38%**



Graph 2: The graph shows the difference in response by cold stimulus between the three groups.

The reduction in **hypersensitivity score for group 1, group 2, group 3 was 80.77%, 83.6%, 88%respectively.**



Graph 3: The Graph shows the difference in Response by Air Stimulus between the Three Groups.

In group 1, a reduction in hypersensitivity recorded was**85.19%**, and in group 2 the reduction in hypersensitivity recorded was **84.47%** and in group 3the reduction in hypersensitivity recorded was **91.3%**

4. Discussion

Dentin hypersensitivity (DH) is a rising concern in clinical dentistry that causes pain and discomfort and negatively affects the quality of life of patients. [4]

The prevalence of dentin hypersensitivity varies between 3% and 57% in the general population. Root instrumentation

during periodontal therapy may lead to cementum removal which explains the higher frequency of dentin hypersensitivity (60%–98%) in periodontitis patients. [3]

According to the results obtained in the present study, on intragroup comparison, a statistically significant reduction in hypersensitivity was observed from the baseline to 3 months for all the stimuli in the three groups. The reduced hypersensitivity in Group 1 can be explained by the prolonged contact time of fluoride with the tooth surface due to the sticky consistency of varnish. [6] The varnish **dries** rapidly leaving behind a thin, transparent coating. There is a deposition of calcium fluoride (CaF_2) crystals on the tooth surface which blocks the patent dentinal tubules but due to need to repeated application for effective results it is not easily accepted by patient. [5] The relief in hypersensitivity in Group 2 and Group 3 can be explained by the secondary dentin formation through stimulation of odontoblasts after laser irradiation. [7] This occludes the dentinal tubules and reduces the dentinal fluid movement. Diode laser also causes depolarization of the nerve endings present at the dentin/pulp interface, thereby increasing the pain threshold. [8]It has been recommended to use two stimuliwith appropriate time interval (about 5 min) between the two stimuli. The reason for this time gap is to avoid overlap of symptoms elicited by each response and to give enough time for pulp to recover.

In the present study, there was a significantly higher reduction in dentin hypersensitivity in Group 2 and Group 3 for all the three stimuli when compared to Group 1 at all follow - up intervals. The results of the tactile stimulus for group 1 shows **87.17%** reduction in hypersensitivity compared to **91.31%** in group 2 and **92.38%** in group 3. The results of the cold stimulus for group 1 shows **80.77%** reduction in hypersensitivity compared to **83.6%**in reduction in hypersensitivity compared to **85.47%** in group 2 and **91.3%** in group 3. Thus it is concluded that group 3 shows statistically significant results in comparison with group 1 & 2 with all the stimulus.

Similar results were obtained in study by **Akanksha Jain, Jyoti Rao, Neha Pal, and Alok Singh. (2020),** according to which diode laser whether used alone or combined with fluoride varnish was significantly more effective than fluoride varnish alone ($P < 0.05$). However, the present results were in contrast to the results observed by **Corona et al. (2003)** [9] and **Dantas et al. (2016)** [10]**,** who reported no significant difference between diode laser and fluoride varnish because both the treatment modalities were equally accepted and effective in reducing dentin hypersensitivity ($P > 0.05$).

5. Conclusion

It can be concluded that both sodium fluoride varnish and diode laser are effective in treating dentin hypersensitivity. However, diode laser used in combination with fluoride varnish is significantly more effective than fluoride varnish alone or diode laser alone in the treatment of dentin hypersensitivity. In order to accept the treatment modality in general more studies with long term follow up are required.

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Nil.

Conflicts of interest

There are no conflicts of interest.

References

[1] Davari A, Ataei E, Assarzadeh H. Dentin hypersensitivity: etiology, diagnosis and treatment; a literature review. J Dent (Shiraz).2013 Sep; 14 (3): 136 - 45.
[2] Holland GR, Narhi MN, Addy M, Gangarosa L, Orchardson R. Guidelines for the design and conduct of clinical trials on dentine hypersensitivity. Journal of Clinical Periodontology.1997; 24: 808– 813.
[3] Jain, Akanksha; Rao, Jyoti; Pal, Neha; Singh, Alok1. Effectiveness of fluoride varnish, diode laser, and their combination in treatment of dentin hypersensitivity: A randomized split - mouth clinical trial. Journal of Indian Society of Periodontology 24 (4): p 369 - 374, Jul–Aug 2020.
[4] Grover V, Kumar A, Jain A, Chatterjee A, Grover HS, Pandit N, et al. ISP good clinical practice recommendations for the management of dentin hypersensitivity. J Indian Soc Periodontol2022; 26: 307 - 33.
[5] Davari A, Ataei E, Assarzadeh H. Dentin hypersensitivity: etiology, diagnosis and treatment; a literature review. J Dent (Shiraz).2013 Sep; 14 (3): 136 - 45.
[6] Langenbach F, Naujoks C, Smeets R, Berr K, Depprich R, Kübler N, Handschel J. Scaffold - free microtissues: differences from monolayer cultures and their potential in bone tissue engineering. Clin Oral Investig.2013 Jan; 17 (1): 9 - 17.
[7] Patil AR, Varma S, Suragimath G, Abbayya K, Zope SA, Kale V. Comparative evaluation of efficacy of iontophoresis with 0.33% sodium fluoride gel and diode laser alone on occlusion of dentinal tubules. Journal of clinical and diagnostic research: JCDR.2017 Aug; 11 (8): ZC123.
[8] Khoubrouypak Z, Hasani Tabatabaei M, Chiniforush N, Moradi Z. Evaluation of the effects of 810 nm diode laser alone and in combination with Gluma© and chromophore on dentinal tubule occlusion: a scanning electron microscopic analysis. J Lasers Med Sci.2020; 11 (3): 268 - 273.
[9] Corona SA, Nascimento TN, Catirse AB, Lizarelli RF, Dinelli W, Palma - Dibb RG. Clinical evaluation of low - level laser therapy and fluoride varnish for treating cervical dentinal hypersensitivity. J Oral Rehabil.2003 Dec; 30 (12): 1183 - 9.
[10] Dantas EM, Amorim FK, Nóbrega FJ, Dantas PM, Vasconcelos RG, Queiroz LM. Clinical Efficacy of Fluoride Varnish and Low - Level Laser Radiation in Treating Dentin Hypersensitivity. Braz Dent J.2016 Jan - Feb; 27 (1): 79 - 82.