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RESEARCH ARTICLE

COMPARATIVE EVALUATION OF EFFICACY OF DIODE LASER, DESENSITIZING MOUTHWASH AND DENTIFRICE IN THE MANAGEMENT OF DENTIN HYPERSENSITIVITY – A RANDOMIZED CONTROLLED TRIAL

***Macha Meghana Lakshmi, Chitithoti Rishitha, Tripasuri Venkata Radhika, Samanvi Ratna Badri Satya and Vadigepalli Sandhya**

Department of Periodontology, Anil Neerukonda Institute of Dental Sciences, Sangivalsa, Visakhapatnam

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**Corresponding Author:*
Macha Meghana Lakshmi

ABSTRACT

Introduction: Dentin Hypersensitivity (DH) is a frequently encountered pathology in the dental office and its management poses a challenge to clinicians. Two treatment modalities: Home-use (Mouthwashes & Dentifrice) and In-Office (Restorative, Endodontic & Periodontal therapies). Diode Laser is under the limelight since a decade for the treatment of DH. **Aim of the study**: To compare the efficacy of Diode Laser with commercially available Desensitizing Mouthwash and Dentifrice in the management of DH. **Materials & methods**: A total of 30 patients diagnosed with DH are included in the study; who are categorized into 3 groups i.e; Group 1 (n=10) treated with Diode Laser with a wavelength of 810/980nm for about 30 seconds to 1 minute; Group 2 (n=10) prescribed Di-Potassium Oxalate Monohydrate Mouthwash (VANTEJ AQUA) and Group 3 (n=10) prescribed Calcium Sodium Phospho-silicate Dentifrice (VANTEJ). Evaluation of DH was done based on patient's subjective response using the Visual Analog Scale (VAS) and Numerical Scale (NS) at baseline, 1 week & 1 month. **Results** & **Conclusion**: The DIODE LASER has greater percentage change in reducing DH within a 1month follow-up period compared to desensitizing mouthwash and dentifrice.

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INTRODUCTION

Dentinal hypersensitivity (DH) is a painful response of the tooth to different stimuli such as 'brushing, acid diets, and thermal changes'. DH is one of the frequently encountered symptoms in the dental office. The management of DH poses a challenge as it is not well understood. DH is defined as, "a short sharp pain arising from exposed dentin in response to stimuli, typically thermal, evaporative, tactile, osmotic, or chemical and which cannot ascribed to any other dental defect or pathology".[1] The hydrodynamic theory supported by Branstrom's evidence is an acceptable explanation of the etiologic mechanisms of DH, upon which is based several treatment options. These include home-use, over the counter desensitizing mouthwashes, dentifrices and in-office procedures and recently, the dental laser has made inroads in the treatment of DH.[2] Before choosing the DH treatment option, the clinician needs to consider an exclusive differential diagnosis. The home use products are simple, logical and routine options for most realistic and mild to moderate DH. Desensitizing dentifrices and mouthwashes are generally acceptable based on their ready availability and ease of use with daily tooth brushing oral hygiene habits.[3] With the introduction of laser technology and its proven utility in dentistry, a supplementary therapeutic for DH is available. Low output power [He-Ne or diode lasers and middle output power [Diode, Nd: YAG, Er:- YAG, ErCr:YSGG, CO2, Argon, and potassium titanyl phosphate {KTP} lasers] have been employed in DH treatment. New diode lasers with higher power output and wavelengths were developed to penetrate tissues with minimal damage.[4]

Aim of the Study: The aim of the study is to compare the efficacy of Diode Laser with commercially available Desensitizing Mouthwash and Dentifrice in the management of DH.

MATERIALS & METHODS

This study was conducted in the Department of Periodontics of the concerned institution in accordance with the Declaration of Helsinki and Guidelines for Good Clinical Practice, after obtaining an ethical clearance from the institution's ethical committee. Subjects were recruited from the outpatient section and informed consent was secured from the prospective participants. Inclusion criteria were: patients having at least two sensitive permanent tooth surfaces [buccal/facial aspects of incisors, canines, or premolars]; sensitive tooth surfaces had wasting diseases and/or gingival recession and no history of periodontal therapy in the previous year. Exclusion criteria were: currently undergoing desensitizing treatment; medical [including psychiatric and pharmaco-therapeutic] history that could compromise the study protocol; pregnant and/or lactating women; any known allergies/history of allergies to dentifrice contents; systemic

conditions that are etiologic or predisposing to dentinal hypersensitivity; eating disorders; any dental treatment that might affect the desensitizing agent being used; any other pathology A total of 45 patients were assessed for eligibility of which 15 patients were excluded as nine of them did not meet the inclusion criteria and six of them refused to participate in the study. Hence a total of 30 patients were included and enrolled in the study. Informed consent was obtained from the subjects after the rationale and purpose of the study were explained. DH was assessed by air blast stimulation (a blast of air from a three-way syringe, connected via an air compressor at a pressure of 60 psi in room temperature). The air jet was directed at the selected surface of the patient's tooth for about 1 second from a distance of 1 cm from the selected. Any uncomfortable sensation produced by the air blast stimulus was recorded .This stimulus was accounted as a combination of thermal and evaporative stimuli. In each patient the examiner tooth that was most sensitive to the air blast stimulus was selected. Evaluation of DH was based on the patient's subjective answer, using the Numerical Rating Scale (NRS) (Figure 1).

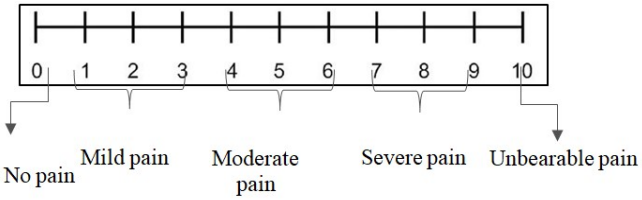


Fig. 1. Numerical Rating Scale (Nrs)

Based on the intervention, all these 30 patients were randomized into three groups i.e, Group 1 (n=10) treated with Diode Laser with a wavelength of 810/980nm for about 30 seconds to 1 minute; Group 2 (n=10) prescribed Di-Potassium Oxalate Monohydrate Mouthwash (VANTEJ AQUA and Group 3 (n=10) prescribed Calcium Sodium Phospho-silicate D (entifrice (VANTEJ). The study duration was 1 month, in which sensitivity scores were measured at baseline, at 1 week and at 1 month.

Fig. 2. Diode laser unit

In Group 1 (Figure 2) the diode laser, operating at wavelengths of 810/980nm and with a power output of 2.5W, utilizes a mechanism of action known as photo-biomodulation, which is applied for a duration of 1 minute in a pulsed, defocused, and non-contact mode of operation.[4](Figure 3& 4) In Group 2, the desensitizing dentifrice (Figure 5) which contains a key ingredient called Calcium Sodium Phospho-silicate, that works through the mechanism of action called tubule occlusion is advised for the patients.[5] To use it effectively, patients were instructed to apply the dentifrice over sensitive areas and brush all the teeth for approximately one minute. Hold the foam in the mouth for one minute and then rinse. It is recommended to follow this routine twice daily for a period of four weeks.

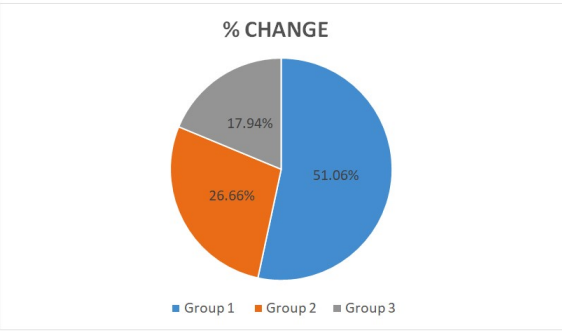
Fig. 3a. Gingival recession in max canine rt

Fig. 3b-Application of Diode laser

In Group 3, the desensitizing mouthwash (Figure 6) which contains a key ingredient known as Di-Potassium Oxalate Monohydrate, that works through the mechanism of action called tubule occlusion.[5] To use the mouthwash effectively, patients were instructed to take 10ml of it and rinse the mouth thoroughly for 30 seconds to 1 minute, ensuring that it reaches all areas and then to spit it out. It is recommended to use the mouthwash twice daily for a period of four weeks.

RESULTS

The data was expressed as Mean ± standard deviation [SD]. Comparison of three groups with respect to change in NRS scores at baseline, 1 week & 1 month and from baseline to 1 week, baseline to 1 month & 1 week to 1 month by Repeated Measures ANOVA test. Statistical significant difference in VAS score reduction was noticed for all the three groups when compared to baseline values compared with one month values, and when one week values were compared with one month values. The DIODE LASER has greater percentage change (51.06%) in reducing DH within a 1 month follow-up period. (Graph 1) Hence Diode Laser is better than Desensitizing dentifrice (26.66%) and mouthwash (17.94%) at one month compared with baseline.



Graph 1. % Change in desensitization in all the three groups

Table 1. Comparison of three groups with respect to change in NRS scores at baseline, 1 week & 1 month and from baseline to 1 week , baseline to 1 month & 1 week to 1 month by Repeated Measures ANOVA test

Group	Baseline	1 Week	1 Month	Baseline to 1 Week change		Baseline to 1 Month change		1 Week to 1 Month change	
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	% Change	Mean±SD	% Change	Mean±SD	% Change
Group 1	4.7±1.56	3.5±0.97	2.3±0.48	1.2±0.3	25.54*	2.4±1.10	51.06*	1.2±0.30	34.28*
Group 2	4.5±1.35	4.0±1.3	3.3±1.05	0.5±0.22	11.11*	1.2±0.04	26.66*	0.7±0.33	17.5*
Group 3	3.9±1.37	3.6±1.26	3.2±1.13	0.3±0.12	7.69*	0.7±0.32	17.94*	0.4±0.17	11.11*

Fig. 4a. Gin rece and attrtn in mand let 1st molar

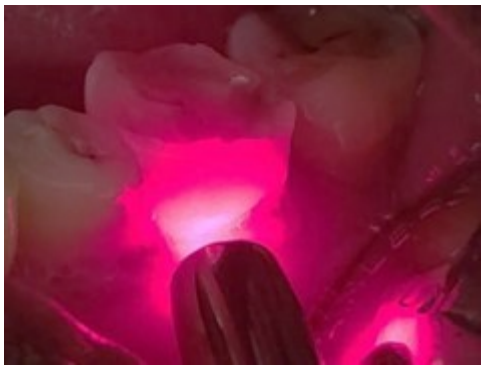


Fig. 4b. Application of diode

Fig. 5. Desensitizing dentrifice

Fig. 6. Mouthwash

DISCUSSION

Dentin hypersensitivity, a challenging condition for clinicians and patients, manifests as a pain response to thermal, chemical, and tactile stimuli, prompting the use of home care products and emerging laser treatments. A comparative study was done to evaluate the efficacy of commercially available desensitizing toothpastes and mouthwashes against Diode Laser in managing dentin hypersensitivity. In a 2017 study by Garcia et al [6]., it was demonstrated that the diode laser exhibited bio-stimulatory and photo-biomodulating effects, leading to an elevation in cellular metabolic activity of odontoblasts and subsequent formation of secondary dentin, ultimately resulting in the occlusion of tubules. A 2011 network meta-analysis by Sgolastra et al[7]. found that laser treatment had superior desensitizing effects on dentin hypersensitivity (DH) compared to no treatment, both immediately after application and after one month. Conversely, a clinical trial by Asnaashari et al[8], in the year 2013, showed no significant difference in efficacy between Nd:YAG, Er:YAG, and diode lasers for managing DH. According to a systematic review by Nicola et al[5], both in-office and self-administered agents were found to be effective in managing dentin hypersensitivity (DH). However, the review highlighted that self-administered agents are more

convenient to use and readily available over the counter compared to professionally applied agents. A study conducted by Tevatia et al[9]in 2017 concluded that the combined application of 5% potassium nitrate (KNO3) with the diode laser is a recommended treatment approach for dentin hypersensitivity (DH) patients. The study suggested that this combination therapy, with a 6-week interval follow-up, was more effective compared to monotherapy in managing DH. Although the findings mentioned previously are encouraging, it is worth noting that a recent systematic review conducted by the Cochrane database did not find strong evidence supporting the efficacy of potassium nitrate formulations in treating dentin hypersensitivity (DH).[10] Additionally, a recent literature review highlights lasers as a promising, safe, and beneficial mode of therapy for DH.[11]

Limitations

To overcome the limitations of the current study, future research should consider extending the follow-up period, increasing the sample size, controlling the use of in-home desensitizing products, investigating potential side effects, and conducting comparative studies to explore different treatment modalities or laser parameters, ultimately advancing the field of dentin hypersensitivity management.

CONCLUSION

The findings of this study suggest that DL (Diode Laser) can be an effective in-office therapeutic procedure for managing dentin hypersensitivity (DH). Furthermore, the combination of Diode Laser with home-use desensitizing agents shows potential benefits in the treatment of DH.

REFERENCES

1) Asnaashari M, Moeini M. Effectiveness of lasers in the treatment of dentin hypersensitivity. *J Lasers Med Sci.* 2013 Winter;4(1):1-7.
2) Dompe, C.; Moncrieff, L.; Matys, J.; Grzech-Leśniak, K.; Kocherova, I.; Bryja, A.; Bruska, M.; Dominiak. Photobiomodulation—Underlying Mechanism and Clinical Applications. *J. Clin. Med.* 2020, *9*, 1724.
3) Dowell P, Addy M. Dentine hypersensitivity--a review. Aetiology, symptoms and theories of pain production. *J Clin Periodontol.* 1983 Jul;10(4):341-50.
4) García-Delaney C, Abad-Sánchez D, Arnabat-Domínguez J, Valmaseda-Castellón E, Gay-Escoda C. Evaluation of the effectiveness of the photobiomodulation in the treatment of dentin hypersensitivity after basic therapy. A randomized clinical trial. *J Clin Exp Dent.* 2017 May 1;9(5):e694-e702.
5) Grover V, Kumar A, Jain A, Chatterjee A, Grover HS. ISP Good Clinical Practice Recommendations for the management of Dentin Hypersensitivity. *J Indian Soc Periodontol.* 2022 Jul-Aug;26(4):307-333.
6) Karim BF, Gillam DG. The efficacy of strontium and potassium toothpastes in treating dentine hypersensitivity: a systematic review. *Int J Dent.* 2013; 2013:573258.
7) Sgolastra F, Petrucci A, Gatto R, Monaco A. Effectiveness of laser in dentinal hypersensitivity treatment: a systematic review. *J Endod.* 2011 Mar;37(3):297-303.
8) Sicilia A, Cuesta-Frechoso S, Suárez A, Angulo J, Pordomingo A, De Juan P. Immediate efficacy of diode laser application in the treatment of dentine hypersensitivity in periodontal maintenance patients: a randomized clinical trial. *J Clin Periodontol*. 2009 Aug;36(8):650-60.
9) Simões TM, Melo KC, Fernandes-Neto JA, Batista AL, da Silva MG, Ferreira AC, de Sousa JA, Catão MV. Use of high- and low-intensity lasers in the treatment of dentin hypersensitivity: A literature review. *J Clin Exp Dent.* 2021 Apr 1;13(4):e412-e417.
10) Tevatia S, Khatri V, Sharma N, Dodwad V. Comparative clinical evaluation of gallium-aluminum-arsenide diode laser and potassium nitrate in treating dentinal hypersensitivity. *J Indian Soc Periodontol.* 2017 Sep-Oct;21(5):391-397.
11) West, Nicola X., Joon Seong, and Maria Davies. "Management of dentine hypersensitivity: efficacy of professionally and self-administered agents." *J Clin Periodontol* . (2015): S256-S302.

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