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Original Article

TO COMPARE AND EVALUATE THE EFFICACY OF BIFLUORID 12, DIODE LASER AND THEIR COMBINED EFFECT IN TREATMENT OF DENTINAL HYPERSENSITIVITY - A CLINICAL STUDY

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Abstract:

Background: To evaluate the immediate efficacy in the reduction of dentine hypersensitivity (DH) when applying an 808±10 nm diode laser (DL) with topical Bifluorid 12® (6%NaF and 6%CaF).

Materials and Methods: The study was conducted on 90 teeth with DH assessed by tactile and cold air stimuli measured by Numeric Rating Scale(NRS).Teeth were randomly divided into G1(30 teeth) treated by Bifluorid 12®;G2(30 teeth) lased at 0.5 W with continuous , noncontact mode with 400µ fibre. Each tooth received one application;G3(30 teeth) received Bifluorid 12® plus laser at same G2 parameters.NRS was checked before starting the treatment and 15 to 30 mins after irradiating and on the 7th day.

Results: Significant pain reduction was seen. The NRS reduction percentages were calculated, and there was a significant decrease of DH in G3 than G2 and G1.

Conclusion:Diode laser is a useful device for DH treatment if used alone and in combination with Bifluorid 12®.

Keywords: Dentine hypersensitivity, diode laser

Introduction:

Dentine hypersensitivity (DH) is an abnormal response of the exposed vital dentine to thermal, chemical, or tactile stimuli.[1]It is characterized by an acute, non-spontaneous, short or long lasting pain that appears suddenly in a specific location, which cannot be attributed to any other dental pathology.[2]It is highly common occurrence that is easy to diagnose with a routine examination.[3]

The DH mechanism could perhaps be explained by a combination of two theories: the ''hydrodynamic theory'' (Brannstrom & Astrom 1972) and the ''neural theory'' (Seltzer et al. 1963). These suggest that various external stimuli cause a movement of fluids in the dentinal tubules, producing a stretching or compressing of the outermost odontoblasts of the pulp and of the nerve endings connected to them, causing pain.[2]

Every treatment, that reduces dentinal permeability, diminishes dentinal sensitivity. The occlusion of dentinal tubules leads to the reduction of dentinal permeability so decreasing the degree of DH.[4] Conventional therapies for DH are based on the local application of desensitizing agents, either professionally or at home. The most frequently used agents can be classified as protein precipitants,[5] tubule-occluding agents, tubule sealants.[6] The sodium fluoride gel (NaF), which belongs to the tubule-occluding agents family, is the most commonly used agent.[7] Its mechanism relies on the mechanical occlusion that is accomplished by precipitation of insoluble calcium fluoride crystals within the tubules without adhesion. For this reason, it cannot resist the stresses of the oral environment and its action decreases with time.[7]

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Another recent proposal is the irradiation of affected teeth with different types of lasers.[8][9][10] Low output power (low-level) lasers have been proven to have significant anti-inflammatory effects,[11] while middle output power lasers have excessive effects on pulp.[12] The diode laser (DL) (gallium/aluminium/ arsenide – GaAlAs) is able to generate a continuous wave without overheating.[9] This type of technology has been tested with different output power levels, combining wavelengths ranging from 660 to 900 nm and application periods from 60 to 150 s, on a single tooth per patient.[10]

Combined use of various therapeutic agents such as sodium fluoride, potassium nitrate and laser has shown to reduce the discomfort of dentine hypersensitivity.[7]

Hence aim of this study is to compare and evaluate the efficacy of Bifluorid 12®(sodium and calcium fluoride varnish),diode laser and their combined effect in treatment of dentinal hypersensitivity.

Material and Method:

The study was conducted in patients aged 25 to 65 years reporting to the Department of Periodontics, A.B.Shetty Memorial Institute of dental science, Deralakatte, Mangalore.

It was conducted in 90 teeth with DH assessed by mean of both air and tactile stimuli measured by Numeric rating scale (NRS). After obtaining ethical clearance from the institutions ethics committee, informed consent was taken from the subjects.

Inclusion criteria included: hypersensitivity of teeth to tactile, cold air stimulus with minimum response of $\geqslant$ 3 in the Numeric Rating Scale (from 0 to 10, where 0 meant the absence of pain and 10 represented an unbearable pain and discomfort felt by the patients in their life).

Exclusion criteria included: patients who underwent any kind of treatment for hypersensitivity in the last 6 months. Clinical or radiographic evidence of caries, restoration and pulpal pathology. Patients showing allergic reactions to Bifluorid 12®.Before any treatment, all the patients received oral hygiene instructions and vitality of teeth being examined was assessed.

For each patient, the sensitive sites were randomly divided into three groups:

(i) Group 1 (G1) (30 teeth) treated with Bifluorid 12® (Figure 1) applied for 60 seconds on tooth

analyzed through the Post Hoc tests (Tukey HSD) (Table: 1)

There was significant difference between G1 and G2 (p=0.012) at 5% mean difference level.

There was significant difference between G1 and G3 (p=0.005) at 5% mean difference level There was no significant difference between G2 and G3.

FIG.1: BIFLUORID 12®

FIG.2: APPLICATION OF ENDOFROST ON COTTON PELLETS

FIG.3: APPLICATION OF COLD PELLETS ON TEETH SURFACE

FIG.4: APPLICATION OF TACTILE STIMULATION

FIG.5: APPLICATION OF BIFLUORID 12 ON TEETH WITH COTTON

FIG.6: APPLICATION OF DIODE LASER ON TEETH SURFACE

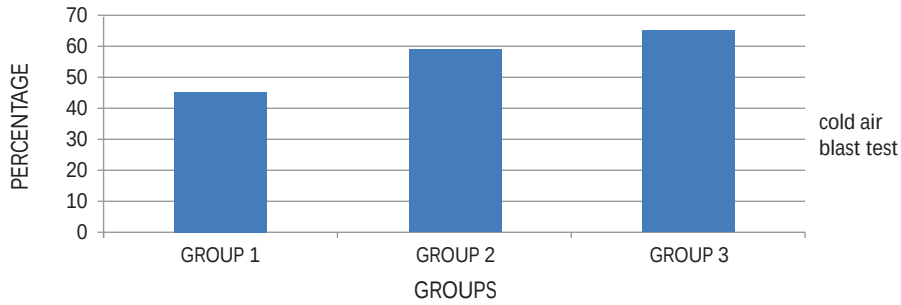

FIG. 7 : PERCENTAGE REDUCTION IN DH IN G1,G2,G3

Table: 1

POST HOC TEST		Multiple Comparison			Difference Tukey HSD	
(I) GROUP	(J) GROUP	Mean difference(I-J)	Std. Error	Sig.	95% Confidential interval	
					Lower Bound	Upper Bound
Group 1	Group 2	-1.50000.	.51255	.012	-2.7222	-.2778
	Group 3	-1.66667.	.51255	.005	-2.8888	-.4445
Group 2	Group 1	1.50000	.51255	.012	.2778	2.7222
	Group 3	-.16667	.51255	.943	-1.3888	1.0555
Group 3	Group 1	1.66667	.51255	.005	.4445	2.8888
	Group 2	.16667	.51255	.943	-1.0555	1.3888

*. The mean difference is significant at the 0.05 level.

Discussion:

Despite the great variety of available therapeutic methods, dentinal hypersensitivity still remains a chronic dental problem with a difficult treatment conduct and an uncertain prognostic. A possible elimination of painful symptomatology resulting from the dentine Hypersensitivity mechanism, seems to be directly related to the interruption of stimuli transmission to the nerve endings of odontoblast processes by reducing the fluid movement inside the dentinal canalicules, through the narrowing or occlusion of tubules openings. (Brannstrom, 1986)

Conventional therapies for the treatment of DH comprehend the topical use of desensitizing agents, either professionally or at home such as protein precipitants,[28] tubule-occluding agents, tubule sealants,[5] and recently, lasers.[8]

Several studies describe a synergistic action of lasers in association with desensitizing agents. In fact, the laser system can favor the permanence of the desensitizer for longer time than when they are used alone. For this reason, if laser device is used in addition to a conventional desensitizing agent, the latter remains above the tooth surface for 60 seconds before the irradiation.[12]

The application of a DL at a wavelength of <780 nm and at an output power below 30mW, with an application time of <3 minutes, is a safe treatment with regard to pulp. Various studies have reported a lack of significant pulp damage or thermal alterations after irradiation of the radicular surface.[13]

In our study, none of the 60 laser treated teeth showed secondary effects, which confirms the safety of this type of treatment. However, inappropriate laser use could result in potential tissue damage, causing thermal lesions on the radicular surface, gingival tissues, dental pulp and adjacent bone.[11]

Focusing on the effectiveness of the sole diode laser, this was investigated by several authors. Matsumoto et al. [14] showed an 85% improvement in teeth treated with laser; Aun et al.[15] reported success in laser-irradiated teeth in 98% of their cases; Yamaguchi et al. [16] noticed an effective improvement index of 60% in the group treated with laser compared to the 22.2% of the control non lased group; Kumazaki et al.[17] showed an improvement of 69.2% in the group treated with laser compared to 20% in the placebo group. Accordingly, in the present investigation, laser therapy promoted a considerable decrease in sensitivity, after 30 days of the first application.

In this study, significant improvements in pain and discomfort were registered in all groups.

Laser showed the best results alone and in combination with Bifluorid 12®, since the percentages of pain reduction in G2 and G3 were more than G1 values. In our sample, the best results were obtained by the combined use of laser and Bifluorid 12® therapy (G3). Results are in accordance with the study which speculate that the laser induced superficial melting that could enable longer tubule occlusion by NaF resulting in the reduction of DH related pain.[10]In the laser group, G2, pain reduction was high at cold air stimulation (59.04%). The results are in accordance

with studies.[8][9][10] Lower reduction values were registered in Bifluorid 12® group, G1.It is probable that the better performance of combined treatment was due to the higher Bifluorid 12® adhesion to the dentinal tubules when combined with laser energy.

In spite of the small sample size evaluated and short post-op re-evaluation period of seven days, which was a limitation of this study,it was noticed that the combination of laser with Bifluorid 12® resulted in a significant reduction of dentine hypersensitivity related discomfort.

Conclusion:

According to these results, the GaAlAs laser showed a very high capability to improve immediately the DH-related pain, both alone and even better in combination with Bifluorid 12®. On the other hand, Bifluorid 12® results, even if positive, cannot equalize the performances of laser. These results have to be confirmed by larger sample size and by longer follow-up periods to confirm the long-lasting action of the combined laser and Bifluorid 12® therapy.

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