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Original Research Article

Evaluation and comparision of the clinical effectiveness of diode laser and Gluma® as desensitizing agents in the treatment of dentinal hypersensitivity

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ABSTRACT

Introduction: Dentin hypersensitivity is one of the most common presenting symptoms in dental practice. It may range from mild discomfort to severe pain affecting the person. Laser desensitization has been introduced as a useful tool for the treatment of hypersensitivity. Gluma® Dentin Bond is an adhesive system, where the primer contains 5% glutaraldehyde and 35% hydroxyethyl methacrylate. Practitioners have reported a strong desensitizing effect of the Gluma® system on dentin

Aim: The aim of this study is to evaluate and compare the clinical effectiveness of Diode laser and Gluma ®desensitizing agent in the treatment of dentin hypersensitivity.

Materials and Methods: 24 patients aged between 20 and 50 years was included to assess tooth sensitivity, a controlled air stimulus (evaporative stimulus) was used. Sensitivity was measured using a 10-cm Visual Aanalog Scale (VAS) score. The teeth was randomly allocated to two groups i.e., Group I or II using the lottery method.

Results: Gluma® showed a statistically significant reduction in the VAS score as compared to diode laser 1, 2- and 4-weeks follow-up period ($p < 0.05$).

Conclusion: The result of the present investigation revealed that application of Gluma® resulted in better control dentin hypersensitivity as compared to diode laser.

1. Introduction

Dentinal Hypersensitivity is most frequently heard complaint from patients in dental office where they may experience sharp pain of short duration ranging from mild discomfort to extreme severity hindering their normal day to day life activities seeking immediate relief. The development of a therapy that can provide both immediate relief following professional application and of vesting desensitization effect for a significant period after use, would be great assistance to dentist dealing with dentinal hypersensitivity. Once a patient has dentin hypersensitivity, any external stimulus, such as physical pressure or air movement, can cause discomfort to the patient. The most widely accepted theory for dentin hypersensitivity is the hydrodynamic theory[1] proposed by Brannstrom,[2] who suggested that pain may result from the movement of the dentinal fluid in the tubules provoked by external stimuli, such as temperature, physical or osmotic changes which, in turn, trigger nerve fibers within the pulp. Approaches to control the condition falls in two broad categories: those that occlude the exposed dentinal tubules and those that reduce the sensitivity threshold of the pulp. The desensitizing agents have been used in different forms like dentifrices, mouthwash or topical gels with variable

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efficiency in reducing or eliminating the hypersensitivity. Laser desensitization has been introduced as an effective tool for the treatment of hypersensitivity. The main advantage of laser treatment is the immediate effect in relieving pain. Amongst the various types of lasers, carbon dioxide laser has been used with promising results in occluding patent dentinal tubules. Recently a new combination product consisting of an aqueous solution of 5% glutaraldehyde and 35% hydroxyethyl methacrylate (Gluma desensitizer, Heraeus Kulzer GmbH, Wehreim, Germany) has been reported to be an effective desensitizing agent. The glutaraldehyde intrinsically blocks dentinal tubules, counteracting the hydrodynamic mechanism that leads to dentin hypersensitivity.[3] Therefore aim of the study is the evaluation and comparison of the clinical effectiveness of diode laser and gluma® as desensitizing agents in the treatment of dentinal hypersensitivity.

2. Materials and Methods

Ethical clearance was obtained from the Institutional Ethics Committee. An in vivo study, was designed and carried out in 20 patients who visited the department. Study designed as double-blind, split-mouth study.

2.1. Inclusion criteria

Patients with good health in the age range of 18–50 years minimum of two hypersensitive teeth which are anterior to the molars defects <1 mm loss of dentin in depth which did not require restorative treatment were selected. Baseline values ≥7 on VAS was kept as an inclusion criteria score. Exclusion criteria Patients with cervical abrasion > 1mm gross underlying pathologies, existing systemic medical condition, pregnant and lactating females.48 teeth were assigned into 2 groups of 24 each following a split-mouth design.

Randomization & allocation concealment was done by a faculty member not involved in any phase. Group I patients were treated with diode laser and group II patients were treated with gluma desensitizer (Figure 1). The sensitivity scores were recorded at baseline.

Baseline sensitivity values were recorded before starting the treatment using tactile method and air blast stimuli.Tactile sensitivity assessed by using a blunt probe used under slight manual pressure in the mesiodistal direction on the hypersensitive areas of the tooth.

Air blast sensitivity assessed by directing a 1–2 s blast of air perpendicular to the exposed dentin (40 ± 5 psi) onto the buccal surface of sensitive tooth from a distance of 1 cm using air component of an air–water syringe.Scores immediately after application, after 1 day and after 1 month were assessed using VAS.

2.2. Statistical analysis

Analysis of data was done by SPSS 23.0 software (SPSS, Chicago, IL, USA). Repeated measures Analysis of variance and post hoc Tukey's test were used to determine the significance of reduction in Dentinal Hypersensitivity of the patients between the two groups at different time intervals. The P values <0.01 are highly significant, <0.05 are Significant.

3. Results

In group I, patients treated with diode laser showed significant results (p = 0.001) after 5 minutes (mean 0.8500), one day (mean 1.2000) 1 and after 30 days (mean1.4000)(Table 1). In group II patients treated with gluma also showed significant results (p=0.000) after 5 min (mean2.5250), one day (mean 3.4750) and after 30 days, (mean 4.5750) (Table 2). When it comes to intergroup comparison gluma showed less VAS score at all times i.e on 5 min, one day, after 30 days (Graph 1). In (Graph 1) group I patients showed VAS scores pre-operatively ,after 5min, one day, one month (7.725, 2.525, 3.475, 4.575) respectively. In group II VAS scores pre-operatively, after 5min, one day, one month (7.725,0.85, 1.2,1.4) respectively.

Table 1:

	Mean	Std. Deviation	F value	P value
After 5 min	08500	.69982	8.470	0.001 HS
After 1 day	1.2000	.60764		
After 30 Days	1.4000	.67178		

Statistical test applied: Repeated measures Anova
HS-Highly significant at p<0.01

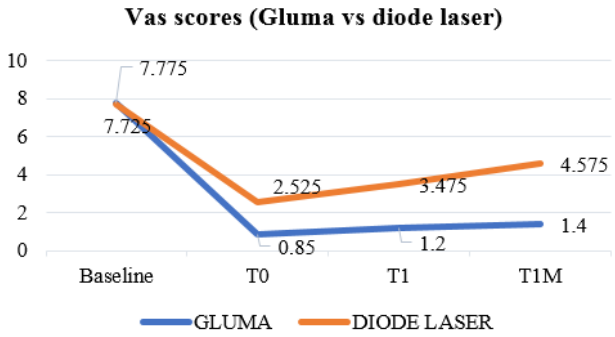
Table 2:

	Mean	Std. Deviation	F value	P value
After 5 min	2.5250	.87669	61.632	0.000 HS
After 1 day	3.4750	.67889		
After 30 Days	4.5750	1.05945		

Statistical test applied: Repeated measures Anova
HS-Highly significant at p<0.01

4. Discussion

Dentin hypersensitivity is characterised by short, sharp pain arising from exposed dentin in response to stimuli, typically thermal, evaporative, tactile, osmotic or chemical, which cannot be ascribed to any other dental defect or pathology.[4] This definition was adopted in the International Workshop on Dentin Hypersensitivity.[5] Discomfort from dentin hypersensitivity is a common finding in adult population, with the available prevalence data ranging from



Graph 1: Showing intergroup comparison of VAS score of diode laser and gluma at all times i.e on 5 min, one day, after 30 days.

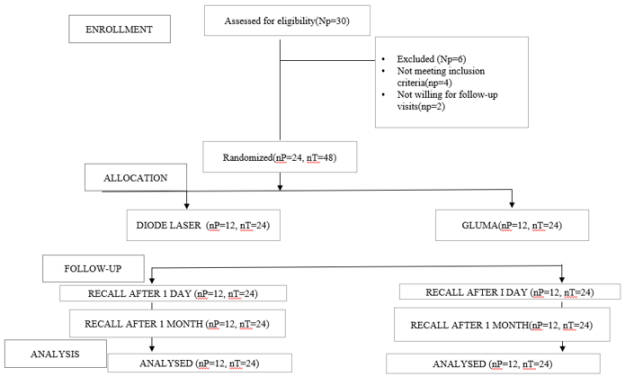


Fig. 1: Np – number of patients, nt- number of teeth.

8–57%.[6] It was found to be much higher in periodontal patients, ranging between 72.5–98%.[7]

Thus, there are two principal treatment options, either to plug the dentinal tubules, preventing fluid flow, or desensitizing the nerve, making it less responsive to stimulation.[8]

There are several chemical and physical agents in use and have been studied. These agents include fluoride containing solutions/compounds,[9] oxalates,[10] potassium chloride or strontium chloride,[11] potassium nitrate,[12] amorphous calcium phosphates,[13] resin-based bonding agents and lasers.[14] Recently, the advent of latest Gluma® desensitizer which is an aqueous solution containing 5% glutaraldehyde and 35% hydroxyethyl methacrylate is a trend. As glutaraldehyde is a biological fixative, the dentinal tubules are occluded due to reaction with plasma proteins from dentinal fluid. Hydroxyethyl methacrylate is a hydrophilic monomer compound of dentin bonding agents with the ability to infiltrate into acid-etched and moist dental hard tissue.[15]

For the laser to be effective, it should have wavelength equal to the target tissue so that the radiations are absorbed well, with very little transmission to the surrounding tissues. The diode laser satisfies this criterion as it works on photobiomodulating action. When the process of odontoblast after laser was observed, it showed large quantity of teritary dentine production and physiological obliteration of the dentinal tubules.[16] The present study, we have utilized diode laser to evaluate its effect on long term basis.

In group I patients who were treated with diode laser immediately after application, only 15% of patients were relieved of dentinal hypersensitivity while 75% experienced slight pain & 10% moderate pain. After 1 day among the total patients, 47.5% and 52.5% showed slight and moderate pain respectively. After 1month among the total patients, 85% and 15% with moderate and severe pain.

In group II immediately after application, 90% of the patients were relieved of dentinal hypersensitivity while 10% experienced slight pain. After one day, 85% patients were relieved of dentinal hypersensitivity. After one month, 82.5% patients were relived of dentinal hypersensitivity.

5. Conclusion

Within the limitations of the present study, it can be concluded that a single topical application of Gluma was effective in reducing dentinal hypersensitivity when compared to Diode Laser. Gluma showed significant decreased in Visual Analog Scale (VAS) scores at all time intervals compared to Diode Laser. Further studies have to be conducted to evaluate the efficacy of Gluma for longer time periods.

6. Conflict of Interest

The authors declare that there are no conflicts of interest in this paper.

7. Source of Funding

None.

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