

Comparative Evaluation of Diode Laser and Dentin Bonding Agent in the Treatment of Dentin Hypersensitivity: An In Vivo Study

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ABSTRACT

Background: Dentinal hypersensitivity is the most common problem of modern times. It usually is caused by the wear out of the enamel and dentin. Lot of treatment modalities has been tried with less success. Hence, the laser has been used recently with relatively more success.

Materials and Methods: Ten patients were selected for this study. In these ten patients a total of sixty tooth were selected from both genders. Detailed history of the patients was taken to prove that the patients are suffering from DH. A radiograph was obtained to prove that there is no underlying pathology or caried which can cause DH.

Results: At base line both the groups showed no significant difference. Immediately after application laser group showed a better result than the dentin bonding group but the data was not statically significant ($p = 0.07$, Table 3). Results after 15 days also showed laser group to be more effective than the bonding group but was statistically non-significant. Results after 30 days showed that the laser group gave far better results than the bonding group and the data was statistically significant ($p = 0.04$).

Conclusion: A significant reduction in DH was observed in laser group. Short term effect of both the treatment modalities were similar.

Keywords: Bonding agent, dentinal hypersensitivity, enamel, laser.

INTRODUCTION

Dentin hypersensitivity is the most common clinical problem that roots considerable distress and pain.¹ A study done by Addy et al. in Canadian Consensus Document, dentin hypersensitivity (DH) can be defined as "pain derived from exposed dentin in response to chemical, thermal, tactile or osmotic stimuli which cannot be explained as arising from any other subsequently modified by the Canadian Board on DH which suggested that "disease" is a more appropriate term than "pathology".^{2,3}

It is preferable to treat hypersensitivity previously the pulpal inflammation ultimately becomes an irreversible condition. It is very difficult to treat DH because it has different origins and there are so many modalities of treatment.⁴ It can be reduced by blocking the dentinal tubules. Matsumoto et al was the first researcher to use laser therapy in treatment of DH.⁵ Various types of lasers i.e He-Ne diode, Co2, Nd:YAG have been used for the reduction of DH. The laser acts by biostimulation because of increased threshold of free nerve

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endings,⁶ analgesic effect due to increased β endorphine and increase in production of mitochondrial ATP.⁷ The decrease of pain happens because of the inhibition of the cyclooxygenase enzyme, which appends the conversion of the arachidonic acid into prostaglandin.^{8(p1)}

MATERIALS AND METHODS

Patients were selected from the out-patient department of conservative dentistry and endodontics. All the patients were informed about the study and written consent were obtained. This research was approved by the institutional ethical board from our institution. The study was carried out from Jan 2019 to May 2019. Power of study was calculated for this work. Ten patients were selected for this study. In these ten patients a total of sixty tooth were selected from both genders. The patients selected were systemically healthy and had no medical history.

Detailed history of the patients was taken to proof that the patients are suffering from DH. A radiograph was obtained to prove that there is no underlying pathology or caried which can cause DH. The vitality of the tooth was checked by pulp tester to rule out non vital tooth. Patients included were systemically healthy with bilaterally hypersensitive teeth present, whose probable etiologic factors included abrasion, gingival recession, parafunctional habits and frequent ingestion of acidic food. Tooth with caries, improper restoration, and fracture were excluded from the study. All the patients were instructed to maintain a strict oral hygiene measure.

DH was assessed by the evaporating stimulus. A strong air blast was given for 2 seconds from a three-way syringe at right angle to the cervical area from a distance of 1 cm. At the same time all the adjacent tooth were covered with or isolated with dry cotton. All the clinical procedures were done by single operator to reduce the inter operator bias.

Data was standardized by scoring the degree of hypersensitivity for each tooth before treatment according to the criteria proposed by Uchida et al (1980)⁹ which establish four degrees for hypersensitivity depending on patient's response to stimulation (Table 1).

Table 1: Degree of Dentin Hypersensitivity (Uchida et al 1980)

Degree	Sensitivity
0	Without significant discomfort.
1	Discomfort with mild pain.
2	Sharp pain solely during the application of stimulus.
3	Sharp pain during the application of stimulus and continues after its removal.

RESULTS

Table 2: Patients demographics.

	Category	Percentage
	Male	5(50)
	Female	5 (50)
Occupation	House wife	2 (22.23)
	Nurse	1 (11.11)
	Student	4 (44.44)
	Employee	1 (11.11)
	Government Officials	1 (11.11)

Table 3: Comparison of mean dentin hypersensitivity between study groups at baseline and different follow-up visit.

Time interval	Laser (Group I) (n=30)	Dentin bonding Agent (Group II) (n=30)	P value
Baseline	1.87 $\pm$ 0.76	1.91 $\pm$ 0.72	0.92
Immediate	1.23 $\pm$ 0.91	1.11 $\pm$ 0.89	0.07
After 15 days	1.11 $\pm$ 0.99	1.29 $\pm$ 0.78	0.05
After 30 days	0.87 $\pm$ 0.83	1.43 $\pm$ 1.09	0.04

Ten patients were selected for this study. In these ten patients a total of sixty tooth were selected from both genders. The patients selected were systemically healthy and had no medical history. Both the gender group had 5 patients each. Gender

group was allocated by coin toss method. There were mainly five occupational group which represented the study subjects. The occupational groups were house wife (22.23%), Nurse (11.11%), Student (44.44%), employee (11.11%), and government officials (11.11%) (Table 2).

At base line both the groups showed no significant difference. Immediately after application laser group showed a better result than the dentin bonding group but the data was not statically significant ($p = 0.07$, Table 3). Results after 15 days also showed laser group to be more effective than the bonding group but was statistically non significant. Results after 30 days showed that the laser group gave far better results then the bonding group and the data was statistically significant ($p = 0.04$).

DISCUSSION

Dentin hypersensitivity is a largely discovered topic in dentistry, with many researches for efficient new methods for its treatment. However, till date there is no recommended treatment of DH. Often bonding agents are considered as gold standard for treating DH but the results of this don't last long.¹⁰ There is recurrence of sensitivity very soon.¹¹ In this study self-etch dentin bonding agent (G-aenial Bond, GC America) was used instead of total etch procedure to prevent the collapse of collagen network. These self-etching primers need no etching or drying so the risk of over drying and over etching is eliminated.¹² They are less technique sensitive.^{13,14} But the biggest disadvantage of the bonding agent is the loss of resin that occludes the dentinal tubules.¹⁵ It was due to this disadvantage that the need was felt for an alternate modality of treatment and hence the laser was introduced. This study therefore focused on comparing the conventional treatment modality of dentin bonding agent as supported by literature with newly introduced treatment with laser. One of the biggest disadvantages of split mouth design is that the subjects act as the controls itself. Moreover, plaque accumulation plays an important role in causing hypersensitivity.¹¹ So the patients were asked to maintain proper oral hygiene and not to use hard brushes.

Several studies have been done to show the effectiveness of GaAIAs laser. It was used at a 30

mW power in a continuous mode for 0.5 – 3 min.⁵ This study showed effectiveness of laser from 58 to 100%.¹⁶ There are no absolute scientific proofs of which would be the most adequate wavelength, as well as timing of application, quantity of joules to be applied, number of applications and the interval between them.¹⁷ Diode laser with settings of 2.0 W and 980-nm sealed exposed dentin tubules effectively without causing significant morphological alterations of the pulp and odontoblasts (Ying Liu et al 2013).¹⁸ Hence diode laser with 980 nm at 30 mW for 1 minute in a continuous non contact mode was used in the present study.

The desensitizing effects of both GaAIAs laser and dentin bonding agent treatments in this study provided a significant relief in sharp painful condition. Nevertheless, the GaAIAs laser in spite of its high cost could be clinically advantageous method to reduce dentin hypersensitivity due to its rapid clinical effectivity with no adverse reactions observed. As such the laser treatment could be suitable for routine clinical management of dentin hypersensitivity. It would be interesting to study the long-term effects of laser treatment in reducing dentin hypersensitivity so as to improve the quality of life of the patients.

CONCLUSION

A significant reduction in DH was observed in laser group. Short term effect of both the treatment modalities were similar. After 30 days the mean laser sensitivity was way less then the bonding agent group and the results were statistically significant.

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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