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COMPARISION AND EVALUATION OF THE CLINICAL EFFECTIVENESSOF 980 nm DIODE LASER ALONE AND WITH 2% STANNOUS FLUORIDE GEL IN MANAGEMENT OF DENTINAL HYPERSENSITIVITY: A CONTROLLED PROSPECTIVE CLINICAL STUDY

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Conflicts of Interest: Nil

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Abstract:

Aim: The aim of this study is to evaluate and compare the clinical effectiveness of 980nm diode laser alone and in combination with topical 2% stannous fluoride gel in management of dentin hypersensitivity.

Method: 60 patients with chief complaint of dentinal hypersensitivity (19-70 years) were included in the study. After phase I theray patients' pain was scored on VRS scale. Patients were divided into two groups: Group I (GI) (267 teeth)- application of 2% SnF2 gel followed by application of GaA1As diode laser (980 nm, 2W, 25 Hz) in continous mode. Group 2 (G2) (267 teeth)- application of diode laser alone. Patients were reassessed after 1 month after baseline.

Result: None of the 60 patients were lost during the study period. Patient's VRS scores of air blast test was recorded at baseline, on 1st day and 1 month interval and compared among two groups. Results are better in group 1 from baseline to one day and from baseline to 1 month i.e. 44.52% reduction in pain and 52.62% reduction in pain respectively.

Conclusion: In treatment of dentinal hypersensitivity 980 nm laser plus 2% stannous fluoride shows better result than 980 nm laser alone.

Key words: Stannous fluoride gel, Diode laser

1. Introduction

The human teeth comprises of Enamel, Dentin, Cementum & Pulp. Dentin is the main supporting structure of the tooth and consists of an organic component containing collagen fibers in a matrix of collagenous proteins and an inorganic component containing hydroxyapatite crystals. Within dentin, dentinal tubules are present, which extend from the external surface to the pulp.[1]

Dentin hypersensitivity is often described as "short, sharp pain arising from exposed dentin in response to stimuli, typically thermal, evaporative, tactile, osmotic, or chemical and which cannot be ascribed to any other form of dental defect or pathology.[1]"

Dentinal hypersensitivity is a prevalent, painful condition of the teeth. In dentin hypersensitivity, lesion exhibit patent tubules at the exposed dentin surface and appropriate stimuli trigger pulpal nerves via a hydrodynamic mechanoreceptor mechanism to produce a typically short, sharp, painful response. Pain due to dentin hy sensitivity is generally transient in nature, occurring instantaneously after a stimulus, and diminished thereafter [2]

Conventional therapies for the treatment of dentinal hypersensitivity comprehend the topical use desensitizing agent, either professionally or at home such as nerve desensitizers (potassium nitrate), protein precipitators (glutraldehyde, silver nitrate, zinc chloride, strontium chloride), dental tubule plungers (sodium fluoride, stannous fluoride, strontium chloride, potassium oxalate, calcium phosphate, calcium carbonate, bioactive glasses), dentin adhesive sealers (fluoride varnishes, oxalic acid and resin, glass ionomer cements, composites, dentin boning agents) and recently lasers that include neodymium: yttrium aluminum garnet laser (Nd :YAG), gallium-aluminum-arsenide laser, erbium-YAG laser.[3]

Stannous fluoride has been incorporated into oral hygiene product to reduce the dentinal hypersensitivity since 1969. The mechanism of action for Stannous fluoride is the chemical precipitation of the Stannous ion which occludes dentinal tubules and thus prevents the stimulation of free nerves endings.[4]

The diode basically does not interact with dental hard tissues; this makes it an excellent soft tissue surgical laser, indicated for cutting and coagulating gingiva and oral mucosa, and for soft tissue curettage or sulcular debridement. It emits laser in continuous-wave or gated- 3 pulsed modes. The diode laser exhibits thermal effects using the "hot-tip" effect caused by heat accumulation at the end of the fiber, and produces a relatively thick coagulation layer on the treated surface. Diode laser causes minimal damage to the periosteum and bone under

the gingiva being treated as well as exhibits the unique property of being able to remove a thin layer of epithelium cleanly, it can be used for a variety of soft tissue procedures without impacting the neighboring area Diode lasers can be used for dental procedures which are predominantly soft tissue procedures and include soft tissue surgery, periodontal pocket therapy advantages of lasers over surgical procedures these include- dry and bloodless surgery, instant sterilization of the surgical site, reduced bacteremia, reduced mechanical trauma, minimal postoperative swelling and scarring and minimal postoperative pain[5]

Efficacy of topical stannous fluoride alone and in combination with soft tissue diode laser, commonly used as anti hypersensitivity agent in the management of DH. Advancement of laser science and its growing employment in dental medicine has contributed an additional alternative option for the treatment of DH.[6]

Taking into consideration, the present study is undertaken to evaluate the efficacy of 980 nm diode laser as an adjunct to snf in the management of dentinal hypersensitivity: A controlled, prospective clinical study.

2. Material and Methods

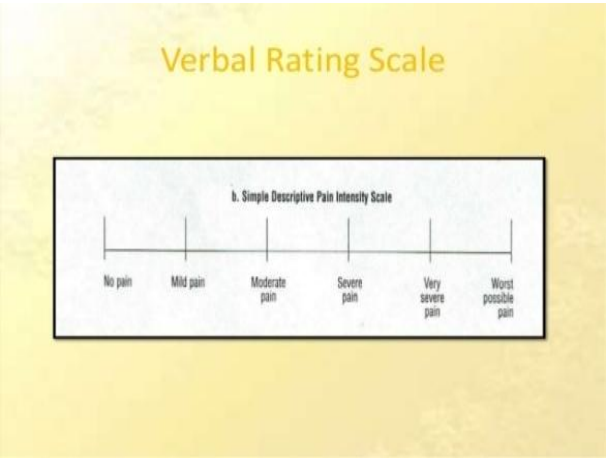
2.1Study design

Present study was conducted in department of periodontology and implantology in D.J. college of dental Sciences and research, Modinagar. 60 patients were selected from out patiemt department. The inclusion crieteria of the patients was male and female in age range of 19-70 years (mean age : 41.67 years) having dentinal hypersensitivity . Patients were excluded if they are having carious lesions on selected or neighbouring teeth any desensitizing therapy on the selected teeth during the last 6 months and cervical fillings on the selected teeth, teeth undergone extensive restoration or endodontic treatment and history of need to contiously take analgesic medication.

2.2 Method

- Phase I periodontal therapy in form of scaling and root planning followed by oral hygiene instructions was given to each and every selected patient and the tooth vitality of all sites was assessed.
- The degree of sensitivity to an evaporative stimulus before and after treatment was determined quantitatively with an air stimulus. To check the cold air stimulus, the selected teeth was isolated, dried and a jet of cold air was applied from a distance of 1 cm for 1 sec. Patient exposure to air stimuli was recorded according to the verbal rating scale (VRS)

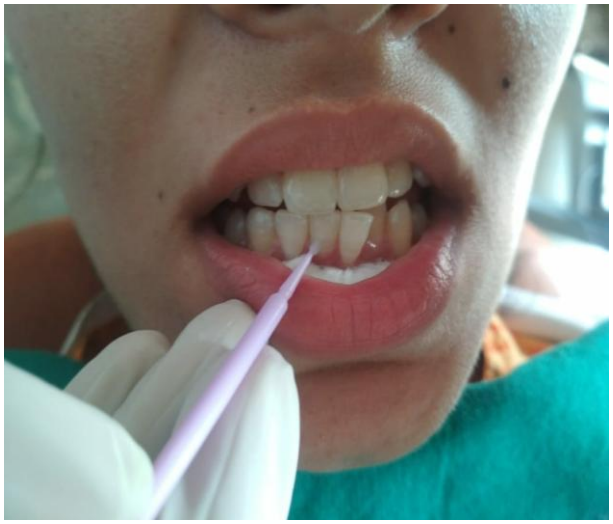
VERBAL RATING SCALE



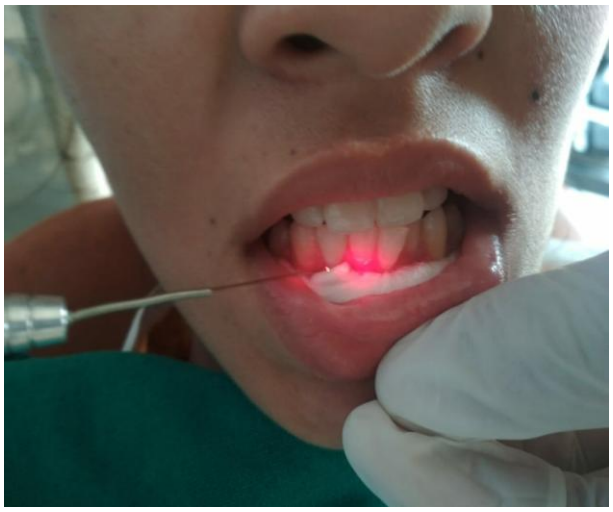
Patients are randomly divided into 2 groups:

- Group I (GI) (267 teeth)- application of 2% SnF2 gel followed by application of GaA1As diode laser (Sunny Germany, 980 nm, 2W ,25 Hz) in continous mode.
- Group 2 (G2) (267 teeth)- application of diode laser at the same parameters employed in group 1.

GROUP I PATIENTS (APPLICATION OF 2% SNF2 GEL FOLLOWED BY APPLICATION OF GAA1AS DIODE LASER (SUNNY GERMANY, 980 NM, 2W ,25 HZ) IN CONTINOUS MODE)

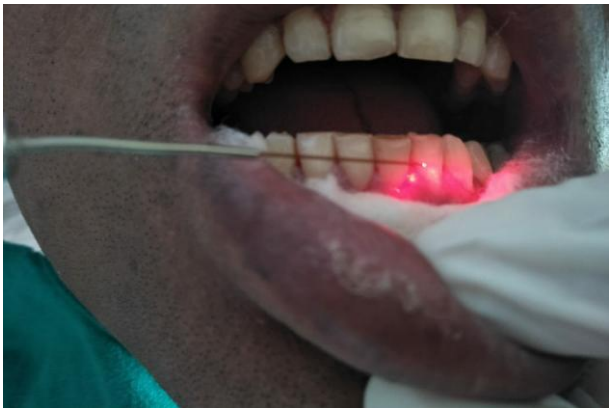


APPLICATION OF STANNOUS FLUORIDE



APPLICATION OF DIODE LASER

GROUP 2 (G2) - APPLICATION OF DIODE LASER



APPLICATION OF DIODE LASER

3. Results

3.1 Baseline presentation: At baseline on VRS scale moderate pain was observed in 24% patients and strong bearable pain was observed in 76% patients (in group 1) and in group II moderate pain was observed in 18 % patients and strong bearable pain was observed in 80% patients (table I).

3.2 Presentation at 01 day: On 1st day 28% patients were scored for light pain and 72% patients were scored for mpderate pain on VRS sacle (group I) and in group II 24 % patients were scored for light pain and 74% patients were scored for moderate pain(table II)

3.3 Presentation on 01 month : On one month follow up in group I 54% patients scored with light pain and 46% patients scored with moderate pain and in group II 52% patients scored with light pain and 66 % patients scored with moderate pain. (table III)

Table 1: VRS SCORES OF AIR BLAST TEST OF STUDY SUBJECTS AT BASELINE

Group	**0** NO PAIN	**1-3** LIGHT PAIN	**4-6** MODERATE PAIN	**7-9** STRONG BEARABLE PAIN	**10** INTOLERABLE PAIN	Pearson Chi-Square Value	P value
I (STANNOUS + LASER)	0 (0%)	0 (0%)	12 (24%)	38 (76%)	0 (0%)		
II (LASER)	0 (0%)	1 (2%)	9 (18%)	40 (80%)	0 (0%)	6.858	0.8**

**** Non Significant**

Table 2: VRS SCORES OF AIR BLAST TEST OF STUDY SUBJECTS AT 01 DAY

Group	**0** NO PAIN	**1-3** LIGHT PAIN	**4-6** MODERATE PAIN	**7-9** STRONG BEARABLE PAIN	**10** INTOLERABLE PAIN	Pearson Chi-Square Value	P value
I (STANNOUS FLUORIDE + LASER)	0 (0%)	14 (28%)	36 (72%)	0 (0%)	0 (0%)		
II (LASER)	1 (2%)	12 (24%)	37 (74%)	0 (0%)	0 (0%)	14.477	0.1**

**** Non Significant**

Table 3: VRS SCORES OF AIR BLAST TEST OF STUDY SUBJECTS AT 1 ONE MONTH FOLLOW UP

Group	**0** NO PAIN	**1-3** LIGHT PAIN	**4-6** MODERATE PAIN	**7-9** STRONG BEARABLE PAIN	**10** INTOLERABLE PAIN	Pearson Chi-Square Value	P value
I (STANNOUS FLUORIDE + LASER)	0 (0%)	27 (54%)	33 (46%)	0 (0%)	0 (0%)		
II (LASER)	1 (2%)	26 (52%)	23 (66%)	0 (0%)	0 (0%)	11.528	0.03*

*** Significant**

4. DISCUSSION

Dentine hypersensitivity (DHS) is one of the most commonly encountered dental problems. It is characterized by short, sharp pain arising from exposed dentine in response to stimuli, typically thermal, evaporative, tactile, osmotic or chemical and which cannot be ascribed to any other dental defects or pathology. Hypersensitivity may present on several teeth, in one area of the mouth, or on one specific tooth . DHS should be differentiated from other tooth sensitivity which may elicit from other clinical conditions such as dental caries, microleakage, cracked tooth or fractured restorations[7].

The clinical management of DHS has been a challenge for clinician, various treatment modalities are available, but the success of any sound treatment plan is depended on taking a detailed clinical and dietary history, differentially diagnose the condition from other dental pain conditions and identify and manage etiological and predisposing factors[7] .

The treatment of chronic dentinal hypersensitivity is based on the concept of reducing fluid movement inside the dentin tubules by narrowing or occluding of tubule openings. Many agents have shown varying degrees of effectiveness on pain resulting from exposed dentine. One which has shown some promising results is stannous fluoride (SnF2)[8]

Stannous fluoride leads to occlusion of dentinal tubules. The occlusion of dentin tubules leads to the reduction of dentin permeability to decrease the feeling of pain from CDH. According to the hydrodynamic theory, the effectiveness of dentin desensitizing agents is directly related to their capacity of promoting the sealing of the dentin canaliculi[9].

In addition Miller et al. reported a tin-rich surface deposit forms in vitro and in situ with two weeks use of an anhydrous 0.4% stannous fluoride gel, providing nearly complete surface coverage and occlusion of the tubules. When the tubules are blocked, the stimulation of the mechanoreceptors does not occur, thus, preventing the pain response[10]

Stannous fluoride has been delivered via a mouth rinse, dentifrice, and gel for some time. In 1985 Blong et al.[11], using a precise thermo-electric stimulator, demonstrated 0.4% SNF2 gel as an effective agent in reducing dentinal hypersensitivity when used twice a day over a two week period. Conclusions supported prolonged use (up to four weeks) and consistent use in order to achieve this affect.

More recent research, Thrash et al.[12,13] supports the theory the time required for a decrease in sensitivity is between two and four weeks from initiation of treatment. Thrash and colleagues compared a 0.4% stannous fluoride gel to an aqueous 0.717% fluoride solution and a placebo at 2, 4, 8, and 16 week intervals following a twice daily application. The results indicated subjects who applied the 0.4% SNF2 reported significantly less sensitivity during the four to eight week period. The effect continued throughout the 16 week assessment period.

Historically, one limitation to its use has been the potential for temporary extrinsic tooth staining associated with the long-term use of these products. Due to advances in dentifrice technology, this occurrence can be mitigated by incorporating certain tartar control and/or whitening ingredients in the formulation provided they do not suppress the desensitizing effects

Dentinal hypersensitivity is a problem that plagues many dental patients. When a patient presents with dentinal hypersensitivity symptoms, they should be examined and informed of the multiple treatment options that may be necessary to eliminate the problem. The patient should be responsible for the decision making process since some of their daily habits may be contributing to the problem and if not

changed the condition will persist. The initial cause, in the majority of cases, is recessed gingiva.

Once the tubules are exposed the patient will experience pain and the initial treatment choice is to cover up the tubules to desensitize the nerves (e.g., stannous fluoride) The product of choice is based on the scientific evidence that supports each active ingredient and the patient's preference for products that will fit most easily into his or her oral hygiene regimen. Based on the volume of scientific evidence, the most effective active ingredients available in toothpaste today to treat dentinal hypersensitivity may be stannous fluoride.

5. CONCLUSION: In present study on VRS scoring better results were scored for group I i.e. laser plus stannous fluoride.

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