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EFFICACY OF Er,Cr:YSGG LASER WITH DIFFERENT TOPICAL DESENSITIZING AGENTS IN IMMEDIATE MANAGEMENT OF DENTINAL HYPERSENSITIVITY: A CASE REPORT

Dental Science

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ABSTRACT

Dentinal hypersensitivity (DH), or cervical dentinal sensitivity, is a frequent clinical disorder. It is defined as pain arising from exposed dentine typically in response to thermal, chemical, tactile or osmotic stimuli. A combination of laser therapy and topical desensitizing agents, can increase the success of the treatment compared with either treatments alone.

The Aim of this study was to evaluate the Efficacy Of Er,Cr:YSGG (Erbium, Chromium: Yttrium-Scandium-Gallium-Garnet) Laser With Different Topical Desensitizing Agents In Immediate Management Of Dentinal Hypersensitivity. As per the inclusion criteria in the present study ; patient who had cervical abrasion with dentinal hypersensitivity without any other defects like decay or fracture was selected for the study. Four tooth were treated with different treatment protocols & one control tooth with no treatment. The different treatment protocols were; Group 1: Laser application only, Group 2 : Topical Fluoride activated with Laser, Group 3 : Topical GC tooth mousse activated with Laser, Group 4 : Desensitizing tooth paste activated with Laser. The assessment of the patients' pain was done with cold air blast test (CAB) and visual analyzing scale (VAS) after stimulation using cold air & probe respectively. Patients' pain was assessed before and just after treatment, and also 1 week and 1 month after the treatment. The results of the study indicated that combination of lasers and desensitizing agents can increase the treatment outcome of dentin hypersensitivity than when used alone.

KEYWORDS

Dentinal hypersensitivity,Topical fluorides, Laser

INTRODUCTION

Dentin hypersensitivity is characterized by short sharp pain arising from exposed dentin in response to stimuli – typically thermal, evaporative, tactile, osmotic or chemical; that cannot be ascribed as any other dental defect of disease. (International Workshop on Dentin Hypersensitivity,1983)

Dentin hypersensitivity (DH) is a prevalent oral problem, affecting more than 40% of adults worldwide. Some studies have reported prevalence levels as high as 68%.[1] The prevalence of DH in India varies from place to place attributed to their local oral practice.[2] The common site of occurrence are the cervical area of teeth in premolars, with Cold being the most common stimuli.[3]

There are many varieties of potential causes for dentin sensitivity. The loss of enamel and removal of cementum from the root with exposure of dentin, however, is a major contributing factor. Enamel loss is usually due to a combination of two or more of the factors such as Attrition, Abrasion, Erosion, Abfraction, Gingival recession, Age changes and some dental treatments like Bleaching & Periodontal therapy[4,5,6]

The two chief methods of treatment of dentin hypersensitivity are tubular occlusion and blockage of nerve activity. [1] Specific dentifrices (containing agents like calcium phosphate, potassium nitrate and oxalates), Dentin adhesives, Resin suspensions (glass ionomer cement), Fluoride rinses and fluoride varnishes, Dentinal adhesives are the conventional methods of dentinal hypersensitivity management undertaken by the clinicians.[5]

Current techniques for treatment may be only transient in nature and results are not always predictable.[5] The laser-assisted treatment of dentine hypersensitivity is a good method to solve immediate and long term pain. Compared to conventional desensitizing topical agents, the laser treatment, although more expensive, leads to rapid reduction in sensitivity with less application time.[7] Only in last decades these procedures have been supported by a laser-assisted treatment, often combined with classic desensitizing therapy.

AIM OF THE STUDY

To evaluate the Efficacy Of Er,Cr:YSGG Laser With Different Topical Desensitizing Agents In Immediate Management Of Dentinal Hypersensitivity

METHODOLOGY

The study is a clinical trial in a patient who had cervical abrasion with hypersensitivity in at least 5 teeth without any other defects like decay or fracture & not exposing the pulp. The patient had history of sensitivity since 1 year without any treatment undertaken for the same. Oral prophylaxis was done 1 week before the study.

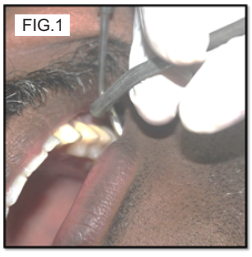
PRE-OPERATIVE ASSESSMENT

Dental examination was performed using 2 tests: Cold air blast test (CAB): - In this test dental stimulation was done using cold air blast from a 3 mm distance and for 1 second, then the clinician asks the patient on how he has experienced the pain, attributing the appropriate score. This was an objective test on the patient's pain perception.

[TABLE 1 & FIG.1]

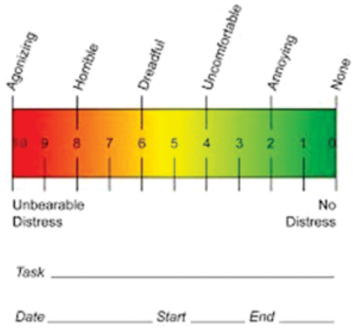
Table 1. Pain perception scoring classification

Score	Pain perception
0	Absolutely no pain
1	Non irritating pain
2	Irritating pain which stops when the stimulus stops
3	Irritating pain which doesn't stop when the stimulus stops



Probing test (VAS) was done using a probe, the tooth is stimulated and the patient is asked to score his pain on a 10cm line. With the explanations that 0 equals absolutely no pain and 10 the more severe pain experienced so far. This is a subjective test and the patient based on his personal experience attributes a score to the pain.

[TABLE 2 & FIG.2]

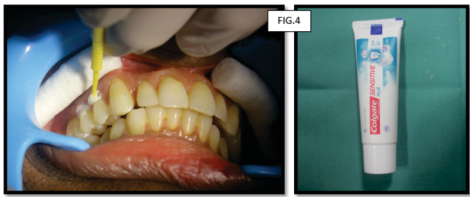


GROUPING

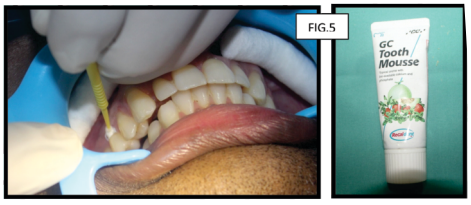
The teeth were divided into 4 different groups depending upon the different desensitizing agents activated laser therapy & one tooth was kept as control.

Group 1 : Laser application only (FIG.3)

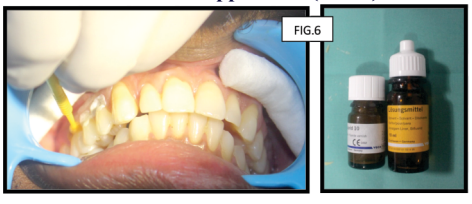
Group 2 : Laser with Desensitizing tooth paste (Colgate sensitive Pro-relief) (FIG.4)



Group 3 : Laser with GC tooth mousse application (FIG.5)



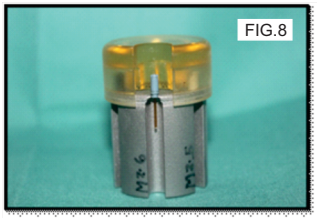
Group 4 : Laser with fluoride application (FIG.6)



One tooth (tooth no.13) was kept as control that did not avail any therapy.

LASER THERAPY

The procedure began with isolation of treatment area with cotton rolls and suction. Er,Cr:YSGG laser (Waterlase, Biolase Technology, Irvine, CA)(FIG.7), which had a wavelength of 2.78 µm, perpendicular to the dentine surface with scanning movements, with a 1-mm defocused beam with 0% water and 10% air for 30 s, and with the following parameters: fixed repetition rate 20 Hz, power 0.25 W. A mZ6 sapphire tip (600 µm diameter, 6 mm length)(FIG.8,9) was used with GOLD handpiece in a non contact mode.



In group 2,3, & 4, the desensitizing agents were applied on the abrasion site for 10 seconds and was activated with laser with the above parameters. Group 1 received only laser treatment.(FIG.10)

POST-OPERATIVE EVALUATION

After completing the laser therapy, the desensitizing agents were washed away with normal water. The 5 teeth were again subjected to cold air blast test & probing test(FIG.11) & the pain was noted using the same scoring criteria used in the pre-operative evaluation. The patient's response was scored after 1 week & 1 month recall.

RESULTS

RESULT OF PAIN SEVERITY EVALUATION USING CAB TEST

TABLE 2:

PRE-OPERATIVE

GROUP	SCORE
Control Group (#13)	3
Group 1 : Laser application only (#25)	2
Group 2 : Laser with Desensitizing tooth paste (#14)	3
Group 3 : Laser with GC tooth mousse (#15)	2
Group 4 : Laser with fluoride application (#16)	3

POST-OPERATIVE

GROUP	SCORE
Control Group (#13)	3
Group 1 : Laser application only (#25)	2
Group 2 : Laser with Desensitizing tooth paste (#14)	1
Group 3 : Laser with GC tooth mousse (#15)	1
Group 4 : Laser with fluoride application (#16)	0

RESULT OF PAIN SEVERITY EVALUATION USING PROBING TEST

TABLE 3:

PRE-OPERATIVE

TOOTH NO.	SCORE
Control Group (#13)	9
Group 1 : Laser application only (#25)	4
Group 2 : Laser with Desensitizing tooth paste (#14)	8
Group 3 : Laser with GC tooth mousse (#15)	4
Group 4 : Laser with fluoride application (#16)	8

POST-OPERATIVE

TOOTH NO.	SCORE
Control Group (#13)	9
Group 1 : Laser application only (#25)	2
Group 2 : Laser with Desensitizing tooth paste (#14)	1
Group 3 : Laser with GC tooth mousse (#15)	1
Group 4 : Laser with fluoride application (#16)	0

DISCUSSION

Although many studies have proved the effectiveness of Er,Cr:YSGG lasers in the treatment of dentinal hypersensitivity; its combination with different desensitizing agent application was questionable.[8]

In our study, 4 teeth with cervical abrasion on CAB & Probing test gave severe painful response by the patient due to the stimulation of large tubule diameter of sensitive teeth when compared with non sensitive teeth.

Laser therapy was first introduced as a potential method for treating dentinal hypersensitivity in 1985.[1] Compared with conventional approaches, in-office DH laser treatment has some disadvantages (ie, high cost, complexity of use, decreasing effectiveness over time, etc) that limit its clinical utility.[9]

According to a systematic review which was done by Sgolastra et al. laser therapy can reduce DH-related pain, but the evidence for its effectiveness is weak, and the possibility of a placebo effect must be considered.[9]

A systematic review of the literature which surveyed the effectiveness of laser therapy and topical desensitizing agents in treating dentine hypersensitivity, indicates the likelihood that laser therapy has a slight clinical advantage over topical medicaments in the treatment of dentine hypersensitivity.[10]

The laser, by interacting with the tissue, causes different tissue reactions, according to its active medium, wavelength and power density and to the optical properties of the target tissue. This produces coagulation of protein without altering the surface of the dentin which in turn results in its blocking of the dentinal tubules.[11]

Pashley suggests that it may occur through coagulation and protein precipitation of the plasma in the dentinal fluid or by alteration of the nerve fiber activity.

The study by McCarthy et al. indicates that the reduction in DH could be the result of alteration of the root dentinal surface, physically occluding the dentinal tubules. [12]

According to Myers & McDaniel's study laser energy interferes with the sodium pump mechanism, changes the cell membrane permeability and/or temporarily alters the endings of the sensory axons[1,13]

Brugnera Júnior et al reported that the laser interaction with the dental pulp causes a photobiomodulating effect, increasing the cellular metabolic activity of the odontoblasts and obliterating the dentinal tubules with the intensification of tertiary dentine production .[1,11]

Low output power lasers such as helium-neon(He-Ne) and gallium-aluminium arsenide (diode) lasers (GaAlAs), a small fraction of the lasers energy is transmitted through enamel or dentin to reach the pulp tissue.

High-power lasers, such as the carbon dioxide, Nd:YAG, Er:YAG and Er,Cr:YSGG lasers, are related to an increase in surface temperature which can result in the complete closure of dentinal tubules after recrystallization of the dentinal surface.[14]

The combination use of laser irradiation with chemical agents such as sodium fluoride and stannous fluoride can enhance treatment effectiveness by more than 20% over that of laser treatment alone.[1,15,16] The combination of Nd: YAG laser and 5% NaF varnish seems to show an impressive efficacy when compared to each treatment alone.[17]

The combined use of the GaAlAs laser with fluoridation enhances treatment effectiveness by more than 20% over that of laser treatment only.[18] The effectiveness of Er,Cr,YSGG lasers combined with desensitizing agents is proved in the study than laser treatment alone.[18]

Erbium lasers are known for their ability to remove hard tissue in a process called ablation.But since the Ablation is not a definitive treatment for DH, they were below the ablation threshold (0.25W) Er,Cr,YSGG lasers have analgesic effect due to depolarization of C-fibres, blocking the transmission of pain stimuli in hypersensitive dentin. It also help in deposition of insoluble salts from the tubules exposed by dentinal fluid evaporation & hence obliterating the dentinal tubules & reducing DH.[19]

In order to increase the effectiveness of lasers, desensitization agents were combined.

Laser when combined with fluoride produce precipitates that seem calcium fluoride deposits on root surfaces and serve as reservoirs to replenish fluoride used during demineralization.[20]

Using a NaF gel in combination with Er:YAG laser, Cakar et al. reported that the tubule orifices were occluded and depressed into craters and that the NaF gel layer can provide reactive fluoride ions that would rapidly form salts, resulting in a layer that blocks the openings dentinal tubules.[21]

In the present study, better results were given by Fluoride varnish combined with laser therapy when compared with GC tooth mousse or Desensitizing tooth paste due to lower viscosity & better penetrability of the fluoride varnish.

Some studies report that obstruction of the dentinal tubules was also better and more in the fluoride-laser group compared to the laser group or the fluoride varnish group.

In the present study, the patient was asymptomatic even after 1 month recall.

CONCLUSION

Er,Cr,YSGG lasers have shown to be effective in relieving immediate DH. Similarly other desensitizing agents have also proved to cause relief from DH.

The present study combines the effect of both the treatment modalities thereby attaining immediate pain relief & long term results.

In conclusion, the study demonstrated that combination of lasers and desensitizing agents can increase the treatment outcome of dentin hypersensitivity than when used alone.

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