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Original article

Comparative Evaluation Of Efficacy Of Commercially Available Desensitizing Tooth Pastes (Shy-Nm And Thermoseal Ra) With 0.33% Acidulated Naf Gel Used With And Without Iontophoresis In Patients With Dentinal Hypersensitivity

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ABSTRACT

Background- Dentin hypersensitivity is a common clinical condition and age-old complaint, presenting problems and discomfort for both the patient and the dentist. The condition may deter a person from maintaining proper oral hygiene further deteriorating oral health.

Aim- To evaluate and compare the efficacy of two different commercially available desensitizing agents and acidulated sodium fluoride (NaF) gel 0.33% with or without the iontophoretic procedure for relieving dentin hypersensitivity.

Study design- Experimental cross-sectional study.

Materials and methods- Hypersensitive teeth were identified clinically by giving a light stroke in the cervical area of teeth using a dental explorer. 96 subjects fulfilling the criteria were divided into 4 study groups. Group A- 0.33% acidulated NaF with iontophoresis, Group B- 0.33% acidulated NaF , Group C- Novamin(shy-NM) and Group D- thermoseal RA. The patients response was recorded on a 4 point verbal rating scale (VRS).

Statistical Analysis- Was carried out using the 19th version of SPSS software. Comparison of the mean score at different time intervals was assessed by student's paired t-test and one way ANOVA test. P value <0.05 and <0.01 were considered statistically significant and highly significant respectively.

Results- All the desensitizing agents used in this study have significantly reduced the discomfort but 0.33% acidulated NaF with iontophoresis has shown better efficacy at the end of one month by reducing Dentinal hypersensitivity upto 95 %.

Conclusion- 0.33% Acidulated NaF with iontophoresis has shown to be better in efficacy than the other agents.

Introduction

Dentin hypersensitivity is a common clinical condition which can have a severe psychological impact on the individuals life style. The tolerance and perception towards this condition vary considerably among individuals depending on factors such as socio-economic status. It usually causes discomfort such that

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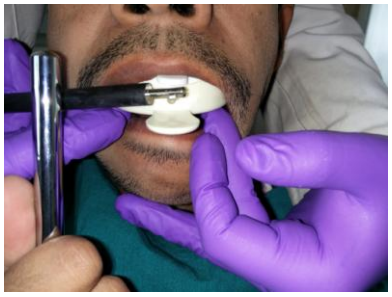
TRAY SELECTION AND MANIPULATION

it may discourage a person from maintaining proper oral hygiene further deteriorating the oral health.[1]

Dentin hypersensitivity which is also termed as sensitive dentin is a severe catastrophic problem caused due to exposure of dentinal tubules or due to receding gums, and the individual experiences sharp dental pain of short duration typically due to different stimuli like thermal, tactile, evaporative, osmatic and electrical. "Localization of pain" is the key factor which helps to differentiate between dentinal hypersensitivity (non pathogenic) and a dental pain (pathogenic). Dentinal hypertsensitivity is a response from a non noxious stimulus and a chronic conditions with acute episodes where as dental pain is a response from noxious stimulus and usually an acute condition. Teeth most commonly affected with dentinal hypersensitivity are maxillary molar teeth and mandibular premolar teeth.[2]

A variety of methods has been advocated for application of the desensitizing agents on hypersensitive teeth. It includes home care and



Iontophoresis unit set up in patient with dentinal hypersensitivity with negative electrode attached to the handle of the tray and positive electrode held by the patient.

professional care. Home care methods include toothpaste, mouth rinses, and chewing gums[1, 3]. Professional care procedures are gels and solutions of desensitizing agents which can be applied using cotton pellets or unwaxed dental floss, tape, or using applicator swab, and desensitizing toothpaste may also be applied with the help of mouth guards and iontophoresis.[4, 5] varieties of products have been reported to be used to successfully treat dentinal hypersensitivity. These products usually occlude and seal the dentin tubules. Resin-based materials also have been reported to successfully reduce dentin hypersensitivity.[1]

The use of calcium compounds, fluoride compounds with or without iontophoresis, oxalates or Pro-Argin technology leads to precipitation of a dentin-like mineral. The use of bioactive glass has shown to form an appetite layer that occludes the dentine tubules due to the presence of silica in its composition which acts as site for precipitation of calcium and phosphates which help in occluding the dentinal tubules.[6]

To enhance the deeper penetration of active ions into the dentinal tubules electric current is also employed along with desensitizing agents and this phenomenon is termed as iontophoresis. And this method have shown more promising and desirable results compared to topical application methods.[2]

Materials and methods-

96 subjects were enrolled in the study, who reported to the OPD unit of our department with the history of hypersensitivity of teeth. Clinically, offending teeth were identified by giving a light stroke using a dental explorer on the cervical region of the teeth. Subjects fulfilling the inclusion and exclusion criteria were included in the study after the confirmatory test was done and divided into 4 study groups. Each group comprised of 24 subjects.

Inclusion criteria- History of tooth hypersensitivity to hot ,cold, hard, sweet or sour food on at least two teeth, hypersensitivity on facial areas of teeth, patient in good health and willingness to participate in this study for a period of one month

Exclusion criteria- Fractured or cracked teeth, periodontitis, tender tooth, patient with orthodontic appliances or fixed prosthesis, patients already taking treatment for same, deep caries or restored teeth, patient on NSAID's or antibiotics, pregnant or lactating mothers and patients on cardiac pacemaker

CONFIRMATORY TEST- The patients fulfilling the inclusion criteria were then evaluated using air blast test. The offending teeth were isolated and the stimulus was applied.

Air blast test;- A blast of air from a 3-way syringe was directed onto the tooth for about 1-2 seconds from a distance of about 10 mm; the adjacent teeth were protected using cotton rolls. The patients' response was recorded on the following Verbal rating scale (VRS).

Study groups-

A total of 96 patients were included in the study and further divided into 4 groups after the stimulus test. Subjects who showed the VRS score of 2 and 3 were enrolled.

Group 1- 0.33% Acidulated NaF with iontophoresis,

Group 2- 0.33% Acidulated NaF without iontophoresis

Group 3- Novamin(shy-NM) application

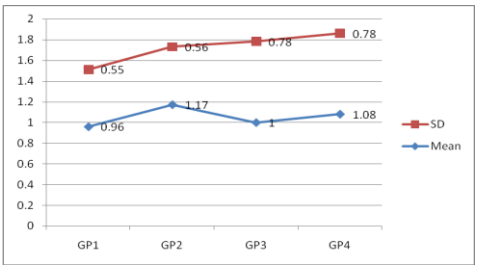
Group 4- Thermoseal RA application.

Procedure-

In **Group 1,** Isolation of teeth to be treated was done using cotton rolls. The negative polarity of the active electrode enhances the absorption of negative fluoride ions into the affected area. Tray foam was manipulated and cut into the appropriate size to fit in the tray and soaked into distilled water and filled with 0.33% NaF gel to use it with active electrode for application to the affected tooth, inactive electrode was wrapped with Cotton soaked in the normal saline and patient was asked to hold it firmly with his fingers. The Iontophoresis unit was switched on to allow the current of 1milli Ampere to be applied for about one minute for each tooth. The electric current used in the iontophoresis method helps in the formation of reparative dentin by directly acting on the exposed dentinal tubules. They also alter the pain sensory mechanism by causing paresthesia.

Group 3 Novamin(calcium sodium phosphosilicate) is the trade mark product of novamin Technology Inc. (NTI) which is now under taken by (Glaxosmith kline). Unlike other desensitizing agents the mechanism of novamin is totally different, it uses two main constituents of hydroxyapatite, calcium and phosphores, to build a hydroxyapatite-like layer over the surface of teeth. The formation of hydroxyapatite rich layer over the exposed dentin surface takes in three steps.

STEP 1: When novamin (commercial name SHY-NM) reacts with saliva, Na+ ions are released, elevating the ph into the range essential for HCA (hydroxycarbonate apatite or hydroxyapatite) formation



Line graph showing the mean and standard deviation noted in all the groups

STEP 2 : Minerals like Ca2+and p5+ ions are released to form calcium-phosphate layer

STEP 3 : This layer crystallizes into HCA (hydroxycarbonate apatite) and seals the open dentinal tubules.

Group 4: Thermoseal RA contains active ingredients of potassium nitrate (5% W/W) and sodium Monofluorophosphate (0.7% W/W) which occlude the opened dentinal tubules thereby reducing dentinal hypersensitivity.

For Group 2, 3 and 4 teeth to be treated are isolated using cotton rolls cleaned and dried. A drop of desensitizing agent for the respective group was applied and left for about 20-30 seconds. The treated teeth were evaluated for baseline readings using stimulus test immediately after treatment then at 2 weeks and at the end of 1 month. If dentinal hypersensitivity still persists at the end of 2 weeks interval, the affected teeth were retreated with the same method and were evaluated for dentinal hypersensitivity using confirmatory test (air blast).

Statistical analysis-

Data sheet prepared using MS office 2007 excel sheet. Statistical analysis was carried out using the 19th version of SPSS software. Results were expressed in terms of mean and standard deviation. Comparison of the mean score at different time intervals was assessed by student's paired t-test and one-way ANOVA test. P value <0.05 and <0.01 were considered statistically significant and highly significant respectively.

Results-

The teeth were subjected to hypersensitivity evaluation criteria after one, two and four week's period of observation. The hypersensitivity was recorded at each recall. Results thus obtained were put to statistical analysis.

The comparison between the results achieved for all the groups. Results obtained showed significant p value of 0.047

Discussion-

Tooth wear is the commonest reason for the exposure of dentin in the cervical areas in the coronal aspect of the tooth due to the loss of enamel. Loss of enamel surface is attributed to non carious lesions of the teeth. When the exposed dentin surface is subjected to thermal, chemical, tactile or evaporative stimuli, the fluid flow within the dentine tubules will be increased Movement of this fluid within the dentine tubules leads to an alteration in pressure and excites pressure-sensitive nerve receptors across the dentine. Pulpal nerves present in intra dentine fibers get excited which are responsible for pain production.[6]

Primary treatment is usually given in order to eliminate the predisposing factors, such as abfraction, abrasive, or erosive components to prevent recurrence. For alleviation of mild to moderate symptoms, plugging of dentinal tubules can be achieved by using desensitizing tooth pastes containing strontium salts and/or highly concentrated fluoride containing agents and also use of potassium salt formulation to modulate the intra-dental nerve excitability has proven to show better results. Cases with severe hypersensitivity have been treated by blocking the tubules in the form of application of dentin bonding agent or adhesive

Group	No. of patients	Mean	Std. Deviation	F	df	p	Inference
GP 1	24	.96	.55	24.7	2	0.047 (<0.05)	Significant
GP 2	24	1.17	.56				
GP 3	24	1.00	.78				
GP 4	24	1.08	.78				

restorative materials. The method of administrating medicines by iontophoresis was popularized in the beginning of the 20th century by Leduc (1900) who introduced the word iontotherapy and introduced the laws associated with the mechanism of this process. Iontophoresis was first used in the early 1960s to treat dentin hypersensitivity. Gangarosa and Hill have provided extensive evidence that iontophoresis is effective in the treatment of several oral mucosal lesions.[7]

Several theories have been postulated to explain the mechanism by which iontophoresis causes desensitization of the dentinal tubules. The first theory explains the formation of reparative dentin induced by application of current to the exposed areas of dentin, which results in the formation of dead tracts. The second theory explains that electrical current causes paresthesia by altering the sensory mechanism of pain conduction taking place in the involved nerves and the last theory postulate that iontophoresis causes precipitation of calcium fluoride blocking the hydrodynamically mediated stimuli that induce pain.[7]

In the present study, reduction in the dentin hypersensitivity significantly reduced in all the groups hwever, results obtained in Group 1 when compared to Group 2 showed that the 0.33% NaF is highly efficacious when used with iontophoresis than applying the same agent alone.

These findings are similar to that of found in the several studies done by Jensen (1964)13, Murthyet al (1973)14, Carlo (1982)15, Lutins et al (1984)16, Mc

Bride et al (1991)17, who have also reported a variable but significant reduction in dentinal hypersensitivity with the use of fluoride iontophoresis. Thermoseal-RA group showed showed inferior results compared to HY-NM (novamin) group but better than that of 0.33% NaF gel alone. ***Vahid Golpayegani et al., [18] (2012) , wang z et al. , [19] (2011), Kern DA et al., [20](1989),*** concluded that NovaMin being a synthetic mineral composed of calcium, sodium, phosphorous and silica releases deposits of crystalline hydroxyl-carbonate apatite (HCA) structurally similar to tooth mineral composition have a greater effect on remineralization of carious-like lesions and also significantly increased the microhardness of enamel when compared to that of fluoride containing dentifrice in permanent teeth. 0.33% NaF gel when applied alone showed less significant results compared to other desensitizing agents used in the study.

The overall comparison of all the groups showed the results in the group 1 (0.33% NaF with iontophoresis) were significantly better than the other groups followed by group 3 patients who were treated using SHY-NM tooth paste both on clinical and statistical observation.

Conclusion-

0.33% NaF gel with iontophoresis has shown better results than other agents used in the study without iontophoresis. Since iontophoresis proves to bring about the promising results in relieving the dentinal hypersensitivity as observed in this study. It can be concluded that iontophoresis gives better results with other agents which are more efficacious than 0.33% NaF gel when used alone.

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