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Effect of Various Desensitizing Dentrifices In The Management of Dentinal Hypersensitivity- A Comparative Study.

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ABSTRACT

To evaluate the effect of various desensitizing dentifrices in the management of dentinal hyper sensitivity.

Dentine hypersensitivity (DH) is a common, painful dental condition with a multi-factorial a etiology. The hydrodynamic mechanism theory to explain dentine sensitivity also appears to fit DH. By definition, DH can only occur when dentine becomes exposed (lesion localization) and tubules opened (lesion initiation), thus permitting increased fluid flow in tubules on stimulation.

The majority of home use de sensitizing products contain a wide variety of active components. This study aims to evaluate the effect of various desensitizing dentifrices in the management of dentinal hyper sensitivity.

The, study in which 45 healthy adults with dentinal hypersensitivity, confirmed at examinations, were randomly assigned to 3 groups where a six-week regimen of unsupervised brushing with potassium nitrate & Stannous fluoride; Sensodyne (Group I); arginine ; Colgate Sensitive Plus(Group II) , and a placebo dentifrice(Group III) are advised. Pain assessment is done before the use of product and after two weeks of product use using air blast sensitivity examination, and a visual analogue scale.

Statistical analysis is done through one way anova test. The results demonstrated a reduction in symptoms for all treatment groups from baseline to 2 weeks in measures of sensitivity. The arginine; (Group I) group showed a higher degree of effectiveness at reducing DH than commercially available potassium nitrate and stannous fluoride dentifrices (Group II) and a placebo(Group III) for both sensitivity measure.

- Group I (Arginine) and Group II (Pottassium Nitrate) showed lower VAS sensitivity values after 2 weeks when compared with baseline.
- Group I (Arginine) showing better reduction in hypersensitivity compared to group 2 and group3.
- Group III (Placebo) didn't have any significant reduction after 2 weeks when compared with baseline score.

KEYWORDS: Detinal Hypersensitivity, Desensitizing Dentrifices, Arginine, Pottassium Nitrate

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INTRODUCTION

Dentinal hypersensitivity (DH) has been defined as a short, sharp pain arising from exposed dentine as a result of various stimuli such as heat, cold, chemical, or osmotic, that cannot be ascribed to any other pathology. [1,2] The incidence of DH may affect patients of any age and reportedly peaks during the third and fourth decades of life. The condition may affect any tooth, but it most often affects canines and premolars. There is a wide variation in the literature regarding the distribution patterns of affected teeth.[3,4]

DH can manifest if dentine is exposed by loss of enamel (due to abrasion, erosion or attrition), keeping the tubules open on the dentine surface. The constant action of acids or loss of structure such as cementum denudes the root surface, which is prone to removal by brushing or periodontal treatment, or more commonly, by the association of two or more of these factors. It may also be caused by gingival recession which physiologically occurs with ageing or pathologically due to chronic periodontal disease or the patient's deleterious habits.[5,6,7] Braennstroem and Astroem in 1964 proposed the 'hydrodynamic theory' which is widely accepted as the explanation of the pain caused by DH.[8] According to this theory, the opening of dentinal tubules due to loss of enamel and cementum in the cervical areas may stimulate the pulp nerves due to the movement of dentinal fluid inside the tubules. This may result in the sensation of pain. Also, bacteria and their elements may diffuse from the oral cavity to the pulp through the open dentinal tubules, resulting in localized inflammatory response.[9] Histologically, under transmission electron microscope, a sensitive tooth shows two times larger tubules and an increased number per area compared to a normal tooth without DH. Although macroscopically the dentine of a hypersensitive tooth does not differ from that of a normal tooth, the symptoms suggest minor inflammation of pulp.[10]

Currently, two major approaches are commonly employed in the treatment and prevention of DH: occlusion of tubules and nerve activity blockage. In the tubular occlusion approach, the tooth is treated with an agent that occludes the dentinal tubules, thus resulting in stoppage of pulpal fluid flow, leading to reduction in DH.[11,12] Treatment strategies such as lasers, dentine
sealers and periodontal soft tissue grafting work on the same principle. In the blockage of nerve activity, potassium ions cause a depolarization of the cellular membrane of the nerve terminal by concentrating on dentinal tubules and thus giving rise to a refractory period with decreased sensitivity.[13]

Desensitizing agents have been classified according to various criteria such as their reversible or irreversible characteristics, their mode of action, whether applied by the patient or professional, or according to their physical and chemical properties. They may be manufactured and delivered in the form of mouthwashes, gels, dentifrices, or agents to be applied topically, such as resin composite,

varnishes, glass ionomer cement and periodontal membranes. The advantage of using products available for home use is that they are immediately available for treatment when compared with those applied by the professional. One disadvantage is that more time is required for remission of symptoms (2–4 weeks), while those applied in-office promote immediate relief.

Considering the aforementioned findings, this study was conducted to assess and compare the efficacy of two commercially available toothpastes containing either potassium nitrate & Stannous fluoride or arginine compared to a placebo in the reduction of DH over a period of 6 weeks.

AIMS & OBJECTIVES

- To evaluate the effect of various desensitizing dentifrices in the management of dentinal hyper sensitivity.

MATERIALS & METHODS :

The, study in which 45 healthy adults with dentinal hypersensitivity, confirmed at examinations, were randomly assigned to 3 groups where a six-week regimen of unsupervised brushing with potassium nitrate & Stannous fluoride ;Sensodyne (Group I); arginine ; Colgate Sensitive Plus(Group II) , and a placebo dentifrice(Group III) are advised. Efficacy measurements at two, four and six weeks of product use included a cold-air sensitivity examination, and a subjective questionnaire examination.

Air blast sensitivity record:

Air blast sensitivity was recorded using the controlled air pressure from the standard dental airway syringe, directed perpendicular to the hypersensitive area from a distance of around 3 mm, with adjacent teeth protected with the gloved fingers to prevent false results.

The record of hypersensitivity was based on the **Visual Analog Scale (VAS)**, the scores were recorded on the 10 cm scale, with stipulated ratings ranging as from 0 to 1 with no pain, 2–3 with slight pain, from 4 to 6 with moderate pain, and from 7 to 10 with severe pain. Individuals who had baseline scores ≥4 were taken up for the study.

INCLUSION CRITERIA:

Patients in the age range of 20–50 years and otherwise healthy patients were included in the study with the complaints of dentinal hypersensitivity.

EXCLUSION CRITERIA:

- Patients with gross underlying pathologies
- pregnant and lactating females
- Fractured tooth
- Trauma from occlusion
- Carious tooth

- Reveresible/Irreversible pulpitis

RESULTS:

- Statistical analysis is done through one way anova test.

Table 1: VAS score at baseline

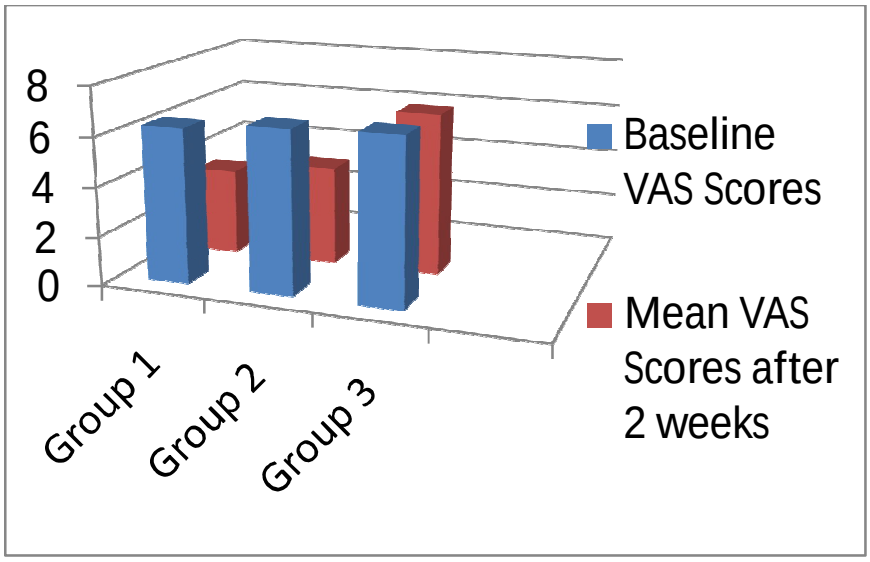
Groups	Mean	SD	F	P
Group I	6.33	1.81	0.350	0.706
Group II	6.60	1.75		
Group III	6.70	1.70		

Table 2: VAS score after 2 weeks

Groups	Mean	SD	F	P
Group I	3.53	1.96	1.658	0.197
Group II	4.03	2.16		
Group III	6.60	1.83		

Table 3: Comparison of change in the VAS scores from baseline to 2 weeks

Change in the vas score	Groups	Mean	SD	F	P
From baseline to after 2 weeks	Group I	1.33	0.76	0.890	0.029
	Group II	1.20	0.61		
	Group III	0.23	0.18		



Mean VAS scores at base line and after 2 weeks

DISCUSSION:

Dentinal Hypersensitivity(DH) is one of the most common and painful, and least successfully treated chronic tooth problems. In 1884, Calvo wrote that 'there is a great need of a medicament, which while lessening the sensitivity, will not impair the vitality of the pulp'.

In spite of a considerable amount of research for more more than 100 years, the clinical management of DH is largely empirical.[14]

Aetiology of dentine hypersensitivity

i. **Exposure of Dentine (Lesion Localisation)**

Dentine exposure can come about by loss of enamel and or gingival recession (with loss of cementum). Loss of enamel, outside acute trauma, is a tooth wear process involving attrition, abrasion and erosion, often in combination.

ii. **Opening of Dentine Tubules (Lesion Initiation)**

In this phase, for the exposed dentin to be sensitized, the tubular plugs and the smear layer are removed and consequently, dentinal tubular and pulp are exposed to the external environment.[15]

Management of Dentine Hypersensitivity:

I. Phase I : Diagonosis

II. Phase II : Eliminating or treating main cause for dentinal hypersensitivity.

III. Phase III : Administration of desensitizing agent.

This study compared two commercially available dentifrices and a placebo toothpaste. The results demonstrated a reduction in symptoms for all treatment groups from baseline to 2 weeks in measures of sensitivity.

The arginine group(Group II) showed a higher degree of effectiveness at reducing DH than commercially available potassium nitrate and stannous fluoride dentifrices and a placebo for both sensitivity measures.

Well-designed clinical trials providing evidence for the formulation containing all potential active ingredients used in this study can be found in the literature.

The potassium nitrate toothpaste was used as a positive control in our study because it has proved to be clinically efficient in the treatment of DH. Some studies have reported the effectiveness of 5% potassium nitrate gel as an active ingredient.

Unlike other products, potassium nitrate does not diminish dentine hydraulic conductivity, or promote obstruction of dentinal tubules by the deposition of crystals.

According to Wilchgers and Ermert and Kim, the desensitizing effect of potassium nitrate is due to the increase in concentration of extracellular potassium around the nerve fibres which cause their depolarization, avoids repolarization and blocks the axonic action. This blocks the passage of nerve stimulus, resulting in inactivation of the action potential.[16]

Fluorides such as sodium and stannous fluoride reduce DH. The application of fluorides seems to deposit calcium fluoride crystals which form a barrier at the inlet of dentinal tubules. High level fluoride products, such as varnishes, form calcium fluoride which can occlude dentine tubules and provide relief from sensitivity. However, low fluoride products, such as dentifrices and

mouthwashes, do not provide significant sensitivity relief. In contrast, stannous fluoride works by depositing insoluble stannous compounds that also occlude tubules to provide sensitivity relief.[17]

Recent investigations have demonstrated that arginine combined with calcium carbonate occlude dentine tubules and that this deposit converts to calcium phosphate. Several randomized controlled clinical trials have demonstrated clear treatment effects of arginine and calcium carbonate toothpastes immediately and up to 8 weeks after treatment.

Arginine and calcium carbonate at the physiologic Ph interact with each other and get bonded to the negatively charged dentin, hence forming a calcium-rich layer onto and into the tubules, consequently sealing them and resulting in the reduction of dentinal hypersensitivity.

The treatment effects were immediate and thought to be due to tubule occlusion by calcium phosphate. Studies in vitro on arginine prophylactic paste and toothpaste confirmed the deposit was indeed largely calcium and phosphate.[18]

The results of this study is in accordance with other random clinical trials, which shows a marked significance in the reduction of dentine hypersensitivity in the arginine group compared to potassium nitrate group.

CONCLUSION

- Group I (Arginine) and Group II (Pottassium Nitrate) showed lower VAS sensitivity values after 2 weeks when compared with baseline.
- Group I (Arginine) showing better reduction in hypersensitivity compared to group 2 and group3.
- Group III (Placebo) didn't have any significant reduction after 2 weeks when compared with baseline score.

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