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Periodontology

Milk: Everyday protection for sensitive teeth

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Abstract

Brief Background

Numerous treatment options are available for treatment of dentinal hypersensitivity but research including herbal/ natural solutions has very limited literature.

Aims and Objectives

To study immediate and prolonged effect of milk for treatment of DH, thus assess its therapeutic use as a potential anti-hypersensitivity agent.

Materials and Methods

Patients were selected randomly and divided in two groups. Commercially available milk was topically applied on selected sites in Group A (Control). Similarly, water was applied in group B (Test). DH was assessed using tactile and air stimulus. Patients response was recorded using Visual analog scale (VAS).

Results

Post topical application of milk following periodontal treatment procedures there was a significant reduction of dentine hypersensitivity.

Summary and Conclusions

An attempt has been made utilizing milk to treat dentine hypersensitivity, thus obtaining a cheaper, fast acting, home use, easily available solution for managing (DH).

Key Words

Milk, sensitivity, tactile, air.

Introduction

Dentine hypersensitivity is generally characterized by a short sharp pain which arises due to exposed dentine typically, in response to external stimuli such as thermal, evaporative, tactile, osmotic or chemical forces and which cannot be explained by any other form of dental defect or pathology [1].

It clinically can be described as an exaggerated response of exposed dentine to application of a stimulus, regardless of its location [1,2].

Pain which is caused by dentine hypersensitivity hinders an individual's everyday activity, such as brushing, eating, drinking, speaking, and even breathing [2]. However, most of the patients do not seek treatment for desensitizing their teeth, because they do not perceive dentine hypersensitivity as a severe oral health problem and prefer over-the-counter products when the problem becomes severe [3].

Several theories have explained dentine hypersensitivity; the most widely accepted theory is hydrodynamic theory which was presented by Brannstrom and Astron [11], which suggested that movement of fluids within the dentinal tubules is due to thermal, mechanical, evaporative, and osmotic stimuli. The flow of liquids in dentinal tubules can trigger nerves along the pulpal canal of the dentine, thus causing pain [12]. Thus, the main approach in the treatment of dentine hypersensitivity is occluding dentinal tubules by, e.g., crystal precipitation in tubule lumen or hydroxyapatite melting [3]. In general, laser therapy, preparations with fluorine, hydroxyapatite, strontium and zinc chlorides and potassium oxalate, as well as dental adhesives and glass ionomer cement are used for the treatment of dentine hypersensitivity [8,13,14]. Despite the large number of published studies, however, there is still no consensus as to which product constitutes the "gold standard" for dentine hypersensitivity treatment [3,9].

It was also observed that after the periodontal treatment, complaints of dentine hypersensitivity are usually high. This further complicates preventive oral hygiene procedures by patients and prevents them from maintaining good oral hygiene which jeopardizes periodontal treatment or may even aid in periodontal treatment failure.

At present, commonly used desensitizing agents generally leave off and don't have long-term effects. So, the development of new desensitizing agents is needed [3,8]. The search for a natural desensitizing agent with long lasting effects has led to the observation that milk had promising effects on dentine hypersensitivity [16].

Milk protein casein has been used to develop a remineralizing agent named GC Tooth Mousse (Recaldent, GC Corp, Japan). This milk protein casein phosphor-peptide (CPP) contains phosphoseryl sequences which by attaching with amorphous calcium phosphate (ACP) of teeth forms stabilized CPP–ACP. This stabilized CPP-ACP prevents the dissolution of calcium and phosphate ions and maintains a supersaturated solution of bioavailable calcium and phosphates [4]. It has also been shown that this stabilized CPP–ACP can effectively remineralize the subsurface enamel lesions [4]. This remineralizing capacity of CPP can also help in prevention and treatment of DH [4]. Cai F et al., proposed in his study that incorporation of casein phosphopeptide-amorphous calcium phosphate nanocomplexes (CPP-ACP) into lozenges significantly increases enamel subsurface lesion remineralization [10]. Ruchi Vashisht et al., in ex-vivo study on artificial early enamel lesions concluded that casein phosphopeptide amorphous calcium phosphate has the significant potential to remineralize the early enamel lesions [12]. Thus milk was chosen as a topical agent to treat this commonly prevalent condition.

Aims and Objectives

The aims and objectives of this study were to assess the immediate and prolonged effect of topical application of milk on dentine hypersensitivity arising after non- surgical periodontal treatment procedures.

Materials and Methods

The study was initiated after obtaining clearance from the institutional ethical committee, Terna Dental College, Navi Mumbai. It was a split mouth randomized controlled trial.

Patients with complaints of Dentinal hypersensitivity were recruited in the study.

Informed written consent was obtained from all the subjects before their participating in the study. 20 patients were recruited in the study and checked for baseline dentine hypersensitivity (DH) scores by visual analogue scale (VAS) method followed by scaling and root planing (SRP).

Inclusion Criteria

- Patients complaining of dentine hypersensitivity.
- Systemically healthy patients
- Patients who readily give informed consent for the study.

Exclusion Criteria

- Patients with unrestored carious lesions and periodontal treatment in the last three-month period.
- Patients on current desensitizing therapy or had received professionally applied desensitizing treatment during four months prior to the study.
- Alcoholism
- Pregnancy
- Consumption of tobacco in any form

To assess dentinal hypersensitivity, a tactile stimulus and controlled air stimulus were used. The response of the patients to all the above-mentioned stimuli was recorded using VAS scale.

The Visual Analogue Score (VAS) that was labelled from "no pain" (0) to "intolerable pain" (10cm/100mm). The subjects were asked to place a mark on a 10 cm–long line of VAS on the proforma depending on the level of pain experienced by the subjects. The markings were made using 2 different colour markers for two different stimuli.

The present study was a split mouth study design wherein two teeth in contralateral quadrant were recruited. In each patient, the sites were divided equally into 2 groups

Group A: Milk (Test)

Group B: Water (control)

Milk and water were applied on the respective control and test sites and swabbed with the help of cotton swab for 5 minutes. Patients were instructed to return for follow up on 4^{th}, 10^{th} and 15^{th} day post-treatment. Tactile test and air blast tests were performed.

Tactile stimuli: A sharp dental explorer was passed lightly across the affected cervical area of the tooth, perpendicular to the long axis of the tooth. The test was repeated three times before a score.

Air blast stimuli: A blast of air standardized at 50 psi/ kg/cm^2 using a pressure gauge, from a dental syringe was directed onto the affected area of the tooth for 1 second from 10 mm; the adjacent teeth were protected using cellophane strips. Sensitivity was measured using VAS score. A period of at least 5 minutes was allowed between the two stimuli on each tooth. The patients were instructed not to eat/drink for 30 minutes after application and not to use any other desensitizing agents and/or pain killers, during the study period. VAS score is used for this study. It is a clinical scale to find out the numerical values of the clinical problem of dentine hypersensitivity.

Re-evaluation using VAS was done at the following time intervals: immediately after applications; at 4^{th} day, 10^{th} day and 15^{th} day after applications of test and control.

Statistical Analysis

All the findings of this study were tabulated and statistically analyzed using standardized software.

Results

All participants completed the study with no reported complications.

There were no significant differences between group A and group B showing similar VAS scores between the groups at baseline. Air blast values on Days 4, 10 and 15 were found to be significantly different ($P < 0.05$) in group A. Group A also showed the lowest air blast scores on Day 10 and 15. No significant differences in group B air blast scores were observed during the experimental period.

Variations in air blast and tactile score values on days 0,4,10 and 15 were found to be significantly different between group A and group B ($P < 0.05$). In group A, air blast and tactile scores showed significant reduction between measurements demonstrating the effect of topical application of milk (test) in reducing dentine hypersensitivity VAS scores ($P < 0.05$). However, no significant reduction was observed in air blast and tactile values within group B at any measurement time ($P > 0.05$) implying that topical application of water (control) had no effect on reducing DH VAS scores. When comparing groups, air blast scores were higher in group B than the others, and were statistically significant.

For clinical observations, changes in air blast scores of sampling sites are shown in Fig. 1. At sampling sites, air blast scores were observed to be significantly different in group A at various time intervals ($P < 0.001$). On baseline, higher air blast scores were obtained in both group A and group B. However, these differences between groups were statistically significant ($P < 0.05$). Tactile scores at sample sites at the measurement times are shown in Fig.

Bar diagram representation tables: The results are depicted as bar diagram as follows (Table 1,2,3 and 4)

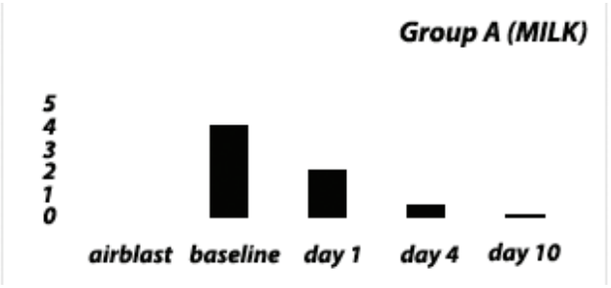

Fig.1: (Milk group [Group A] on application of air blast there is a significant decrease in dentine hypersensitivity at the test sites)

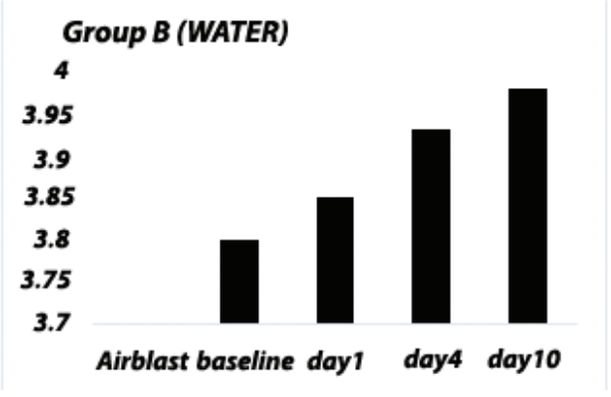

Fig.2:(Water group [Group B] on application of air blast there is significant increase in dentine hypersensitivity at the control sites)

Fig.3:(Milk group [Group A] on evaluation with tactile stimulus there is a marked reduction in dentine hypersensitivity scores in test site)

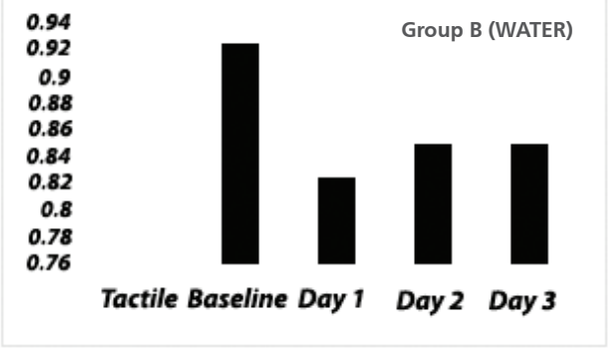

Fig.4:(Water group [Group B] on evaluation with tactile stimulus there is no change in dentine hypersensitivity scores for control sites)

2. Differences in tactile scores were found to be significant in group A ($P < 0.001$). However, the group B had a higher tactile score than group A on Day 4th ,10th and 15th days. These differences were statistically significant ($P < 0.05$).

Changes in air blast and tactile scores levels were statistically significant in group A on days 4th, 10th and 15th days ($P<0.05$) ($P < 0.05$) ($P < 0.001$). When comparing groups, Air blast and tactile scores obtained for group B on 4th, 10th and 15th days had no statistical differences observed ($P > 0.05$). The lowest scores for air blast and tactile were obtained in group A for all measurements, and group B had a higher score on day 4th, 10th and 15th day. On all experiment days, the tactile and air blast was significantly reduced in group A indicating positive effect of milk in reducing DH scores. A positive correlation was observed between air blast and tactile score in the group A on 4th, 10th and 15th days.

Discussion

Periodontal diseases are very common in the general population and most of the patients seek treatment either in the form of nonsurgical or surgical periodontal therapy. It was observed that after periodontal treatment procedures, patients usually start complaining of hypersensitive teeth which may make them reluctant for oral hygiene preventive procedures and further periodontal treatment as well. The consequence of it may result in poor periodontal health.

Periodontal therapy in the form of nonsurgical and surgical procedure is common and patients usually report discomfort/pain immediately following these procedures. Post-periodontal treatment procedure, dentine hypersensitivity is a common clinical condition and complaint. Discomfort and sometimes pain caused by DH may refrain a person from establishing and maintaining adequate oral hygiene, which further may complicate oral health. Dentine hypersensitivity is characterized by a sharp pain or discomfort arising as an overt response to thermal, chemical or osmotic stimuli which cannot be explained as arising from any other disease or dental problems [1,13].

B Von Triol et al., in their review described dentine hypersensitivity as a short and sharp, painful response to an external stimulus applied to exposed dentine (Chabanski & Gillam, Holland et al.,) [6,15,16]. B Von Troil found a prevalence of root sensitivity of 9-23% and 54-

55% before and after periodontal therapy respectively and proposed that it occurs in approximately half of the patients following subgingival scaling and root planing and its intensity increases for a few weeks after therapy and decreases afterwards [6].

Over the years many treatment modalities of dentine hypersensitivity with varying outcomes have been reported but none provided definite conclusion as to which treatment is superior. They are either in-office procedures or self-administered for at home-use. These methods function through blocking the pain response either by occluding the dentinal tubules or by preventing the neural transmission. Even a large number of published studies is not able to provide a gold standard of treatment or product for treatment of dentinal hypersensitivity.

DG Gillam and R Orchardson stated that the individuals with periodontal disease have higher prevalence of dentinal hyper- sensitivity after periodontal therapy such as scaling and root planing procedures as compared to those presenting with healthy mouths and gingival recession[12]. Tammaro et al., concluded that successful periodontal treatment can be accomplished through good oral hygiene self-care measures, and by nonsurgical and surgical periodontal therapies which have unwanted side effects including gingival recession, exposure of underlying dentine following root cementum denudation with the risk of experiencing tooth sensitivity.[13] Acidic foods and drinks can change the oral environment which can dissolve the newly created smear layer. [14]

The purpose of this study was to assess the dentine hypersensitivity after non-surgical periodontal treatment (scaling and root planing) and clinically evaluate the effectiveness of milk topically as a desensitizing agent for post scaling and root planing dentine hypersensitivity. The values of DH at first visit are shown in [Table:1], which gives an estimate of 77.5% of DH after non-surgical periodontal therapy [Table/1]. This predicts about 42.5% incidence and 77.5% prevalence of DH after scaling and root planing procedure. The study strongly demonstrated

Table 1: Intergroup comparison between control and test group for Air blast scores

	Group A	Group B		t	P Value
	Mean (± sd)	Mean (± sd)			
1- Baseline	4.13(1.297)	3.80(1.093)	3.80(1.093)	-1.509	.148
2- 4th day	2.15(1.113)	3.85(1.113)	3.85(1.113)	5.163	.000
3- 10th day	.600(.9119)	3.93(1.1067)	3.93(1.1067)	13.934	.000
4- 15th day	.20(.523)	3.98(1.057)	3.98(1.057)	18.852	.000

Table 2: Intergroup comparison between control and test group for tactile scores

	Group A	Group B	t	P Value
	Mean (± sd)	Mean (± sd)		
1- Baseline	.95(1.538)	.925(1.2698)	-.060	.953
2- 4th day	.08(.245)	.825(1.1729)	2.881	.010
3- 10th day	.08(.245)	.85(.245)	2.869	.010
4- 15th day	.05(.224)	.85(1.171)	3.018	.007

Table 3: Intra group comparison of air blast and tactile scores for Group A (Milk)

	Baseline		4th day		10th day		15th day		Anova	P value
Air	4.13	±1.297	2.15	±1.443	.60	±.912	.20	±.523	52.176	.000
Tactile	.95	±1.538	.08	±.245	.08	±.245	.05	±.224	6.159	.001

Table 4: Intra group comparison of air blast and tactile scores for Group B (Water)

	Baseline		4th day		10th day		15th day		Anova	P value
Air	3.80	**±1.093**	3.85	**±1.113**	3.93	**±1.067**	3.98	**±1.057**	.103	.958
Tactile	.925	**±1.2698**	.825	**±1.1729**	.850	**±1.1709**	.850	**±1.1709**	.026	.994

positive results for the treatment of DH with milk application [Table 2]. Therefore, it is evident from this study that at fifteenth day, the DH has reduced considerably. Milk is a mixture of emulsions, colloids, molecular and ionic solutions. Fresh milk has a pH of 6.7 and is slightly acidic. Milk is also an excellent buffering solution which can resist a change in pH on addition of acid or alkali. When the pH of milk is changed, the acidic or the basic groups of the milk proteins will be neutralized. With the fall of the pH of milk, the charge on the casein also falls and it precipitates. Milk comprises less than 1% salts mainly in the form of chlorides, phosphates, citrates of calcium, sodium and magnesium. Calcium, magnesium, phosphorus and citrates are distributed between the soluble and colloidal phases. Equilibria of salts in milk are altered by heating, cooling and change in pH. Milk also contains various enzymes like phosphatases, lipases, peroxidases and catalases etc [15].

It is proposed from this study that scaling and root planing may itself create a smear layer that could be supplemented by natural dentinal tubules mineralization process through frequent topical milk application. Topical application with milk may provide the rich bioavailability of calcium and phosphate which can aid in remineralization, acid buffer and reduce the acidic effect of plaque on tooth structure. Milk also contains immunoglobulins [16], which may provide defences against plaque microorganisms. Thus, the results of this study suggested and indicated that dentine hypersensitivity in most of the cases occurs invariably after non- surgical periodontal treatment and rinsing with milk could be very effective in reducing the dentine hypersensitivity after periodontal treatment procedures.

This study clearly establishes the desensitizing therapeutic benefit of milk application following non-surgical periodontal treatment.

Conclusion

The present study demonstrated clearly that the topical application of milk at room temperature for few days is effective in reducing dentine hypersensitivity after periodontal treatment procedures. Milk is a suitable, cheaper, fast acting, home-use and easily available solution to the problem of dentine hypersensitivity and can be used as desensitizing agent for dentine hypersensitivity due to periodontal treatment procedures.

Further studies are required to know the detailed mechanism of topical milk application in prevention and treatment of dentine hypersensitivity.

Conflict of Interest: None

Source of Support: Nil

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