

INSTANT DENTIN HYPERSENSITIVITY RELIEF WITH A SINGLE TOPICAL APPLICATION OF AN IN-OFFICE 8% ARGININE CONTAINING DESENSITIZING PASTE Original Article

Archita Kikani*, Hiral Parikh**, Sunita Dhaka***, Ankina Joshi****, Harsh Shah*****, Mihir Shah*****

ABSTRACT

Objective: The aim of this survey was to evaluate the clinical efficacy of the desensitizing paste with pro-argin™ formula containing 8% arginine and calcium carbonate on dentinal hypersensitivity relief after a single professional application without further at-home brushing. **Materials and methods:** This survey was carried out in 288 patients taken from the OPD of department of periodontology in Ahmedabad dental hospital with age of 18 to 70 years in 2 months period of time duration. They were required to possess a minimum of two hypersensitive teeth in two different quadrants which demonstrated cervical erosion/abrasion or gingival recession. Dentinal hypersensitivity evaluation was carried out in one or two severely affected teeth in oral cavity with different etiologic factors like gingival recession, abrasion, attrition, erosion or post scaling in 288 different subjects by single investigator. Dentinal hypersensitivity severity and its relief after application of the desensitizing tooth paste was evaluated by using the visual analog score (VAS) card. **Conclusion:** The in-office desensitizing paste containing 8% arginine and calcium carbonate provides significant reduction in dentin hypersensitivity instantly after a single professional application of the product and this reduction is maintained for 12 weeks without further application of arginine.

KEYWORDS: dentinal hypersensitivity, desensitizing paste, visual analog score

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INTRODUCTION:

Dentin hypersensitivity is characterized by short, sharp pain arising from exposed dentin in response to external stimuli, typically thermal, evaporative, tactile, osmotic or chemical, and which cannot be ascribed to any other form of dental defect or disease.^{1,2} The most frequently experienced pain from dentin hypersensitivity is characterized by a rapid onset, sharp burst of pain of short duration (seconds or minutes) associated with A-beta and A-delta nerve responses to stimuli.^{1,3,4} As several oral conditions can give rise to dental pain, such as untreated caries, a split tooth or a cracked cusp, the correct attribution of dental pain to dentin hypersensitivity is essential to assess appropriate treatment options.^{5,6}

Typically, dentin hypersensitivity occurs when the external stimulus contacts exposed dentin, triggers a rapid outflow of dentin fluid, and the resultant pressure change across the dentin activates intradental nerve fibers to cause immediate pain.^{1,7,8} Tactile, cold and osmotic stimuli all trigger rapid fluid outflow. Heat, on the other hand, triggers a slow retreat of dentin fluid, and the resultant pressure change activates the nerve fibers in a less dramatic fashion, consistent with the observation that cold is generally more problematic to sufferers

than is heat.¹

The hydrodynamic theory of dentin hypersensitivity, as this mechanism has become known, requires that dentin tubules are open at the dentin surface and patent to the pulp.^{9,10}

Dentin can become exposed through gingival recession or through enamel loss. Gingival recession and exposure of the underlying dentin are caused by overzealous tooth brushing and improper tooth brushing technique, or by periodontal disease and its surgical and non-surgical treatment.^{1,11} Based on in vitro and in situ studies, it appears that normal tooth brushing does not cause significant enamel loss. However, erosion from acidic foods and drinks, in combination with tooth brushing, can result in significant tooth wear on any aspect of the tooth surface, especially the cervical area.^{1,12-14} Experts have concluded that gingival recession, rather than cervical enamel loss, is the key predisposing factor for dentin hypersensitivity.¹

Exposed dentin tubules are loosely occluded by a coating, known as the smear layer, comprised of protein components and calcium phosphate deposits derived from saliva. On the basis of in vitro studies, it has been suggested that both chemical and physical forces can remove the smear layer to open exposed dentin tubules.¹ While there seems

*Professor, **Professor, ***Post Graduate Student, **** Post Graduate Student, *****Reader, ***** Professor and Head of Department.

DEPARTMENT OF PERIODONTICS AND ORAL IMPLATOLOGY,
AHMEDABAD DENTAL COLLEGE AND HOSPITAL, TA. KALOL, DIST: GANDHINAGAR, GUJARAT, INDIA.
DEPARTMENT OF PUBLIC HEALTH DENTISTRY, AHMEDABAD DENTAL COLLEGE AND HOSPITAL.

ADDRESS FOR AUTHOR CORROSPONDENCE : Dr. Archita Kikani, TEL: +91 9825436907

little doubt that acidic foods and drinks are able to remove the smear layer and soften dentin rendering the surface softened dentin tissue susceptible to physical forces, such as tooth brushing, clinical data suggest that physical forces alone are not a key factor in removing the smear layer and opening exposed dentin tubules.¹

Dentin hypersensitivity is typically experienced by the adult population, age range from 20-49 years, with peak incidence between 30-39 years. The buccal cervical regions of the permanent teeth are the most commonly affected surfaces, with canine, pre-molar and incisor teeth being more frequently affected than molars.^{1,5} Studies of the prevalence of dentin hypersensitivity have reported levels in the range 4-57% in general dental practice settings, others have suggested levels of 15-25% are typical. The reported wide variations have been attributed to different methods of assessment, self-reported or professional clinical diagnosis, the population base and setting, and behavioral factors, such as oral hygiene habits and intake of acidic foods and drinks.^{1,5,7,12} Levels of dentin hypersensitivity are higher, ranging from 60-98%, in patients following periodontal treatment.^{1,5,1}

The theory of hydrodynamic transmission proposed by Brännström¹³ is generally accepted for pain generation: an external stimulus provokes a movement in the dentin fluid, which in turn triggers nerve endings within the pulp. Products for the management of dentin hypersensitivity typically aim to control the hydrodynamic mechanisms of pain.¹⁴ Approaches to control the condition fall into two broad categories: agents or products that reduce fluid flow within the dentin tubules by occluding the tubules themselves, thereby blocking the stimuli, and those that interrupt the neural response to stimuli.¹⁴

The development of a new technology, *ProArgin*, based upon saliva's role in the natural process of tubule occlusion for instant and lasting relief of sensitivity. Saliva plays a role in naturally reducing dentin hypersensitivity by transporting calcium and phosphate into dentin tubules to induce tubule plugging and by forming a surface protective layer of salivary glycoprotein with calcium and phosphate. Because alkaline pH favors these processes, salivary factors that maintain slightly alkaline pH in vivo have been suggested to favor

occlusion. Investigations of the science underpinning the mechanisms of natural occlusion have resulted in the development of a new “saliva-based composition” comprising arginine, an amino acid which is positively charged at physiological pH, bicarbonate, which is a pH buffer, and calcium carbonate, which is a source of calcium.¹⁵ A recent clinical study¹⁴ sponsored by the Colgate-Palmolive Company has confirmed that this in-office desensitizing paste provides instant

sensitivity relief, when applied after professional cleaning procedures, and that the treatment effects last for at least 28 days. Colgate has further developed this innovative technology by combining the key components, arginine and calcium carbonate, with fluoride to provide a significant advance in everyday treatment of dentin hypersensitivity.¹⁶

A new dentifrice containing 8.0% arginine, calcium carbonate, and 1450 ppm fluoride, as MFP, has been clinically proven to provide lasting relief of sensitivity and superior relief.

Kleinberg¹⁵ suggested that the arginine physically adsorbs onto the surface of the calcium carbonate in vivo, forming positively charged agglomerate which readily binds to the negatively charged dentin on the exposed surfaces and within the tubules. In addition, the pH of the arginine-calcium carbonate agglomerate is sufficiently alkaline to facilitate deposition of calcium and phosphate from saliva and/or dentin fluid. The results of the mechanism of action studies are consistent with Kleinberg's hypothesis and support that interaction of arginine and calcium carbonate in vivo triggers deposition of phosphate, in addition to arginine, calcium, and carbonate on the dentin surface and within the dentin tubules.¹⁷ Four clinical studies have shown that a single in-office application resulted in instant relief of Dentinal hypersensitivity and that the relief was maintained with subsequent twice-daily at-home brushing.¹⁸⁻²² Preferably, a desensitizing in-office product should result in instant relief of DH and the relief should be maintained without further interventions. Therefore, this survey was carried out to evaluate the clinical efficacy of the desensitizing paste with pro-arginTM formula containing 8% arginine and calcium carbonate on DH relief after a single professional application without further at-home brushing.

Materials and Method:

This survey was carried out in 288 patients taken from the OPD of department of periodontology in Ahmedabad dental hospital with age of 18 to 70 years in 2 months period of time duration. They were required to possess a minimum of two hypersensitive teeth in two different quadrants which demonstrated cervical erosion/abrasion or gingival recession. Any teeth with cracked enamel, caries, mobility greater than one or extensive/defective restorations, teeth used as abutments and teeth with orthodontic appliances were excluded. Additional exclusion criteria were: subjects with gross oral pathology, chronic disease, advanced periodontal disease, periodontal or orthodontic treatment (within the last 6 months), eating disorders, excessive

exposure to acids, pregnant or lactating women, current users of anti-convulsants, antihistamines, antidepressants, sedatives, tranquilizers, anti-inflammatory drugs or daily analgesics, as well as subjects who used a desensitizing dentifrice within the last 3 months or with a history of allergy to oral care/personal care consumer products or their ingredients.

Clinical interventions

Dentinal hypersensitivity evaluation was carried out in one or two severely affected teeth in oral cavity with different etiologic factors like gingival recession, abrasion, attrition, erosion or post scaling in 288 different subjects by single investigator. Dentinal hypersensitivity severity and its relief after application of the desensitizing tooth paste was evaluated by using the **visual analog score (VAS) card**. Technique of using the paste is described as below:

Technique:

- The patient is requested indicate the severity of pain in the VAS card.
- Desensitizing paste is applied with a finger tip on affected area by the patient.
- After waiting for 5 minutes, patient is requested to indicate the level of tooth pain in the VAS score card.
- The difference between before and after score on the VAS card is used by the dentist to determine the level of effectiveness of desensitizing paste in

providing relief from tooth pain.

- Score:

VAS score Difference	Effectiveness Quotient
1-2	Low effectiveness
3	Moderate effectiveness
4-5	High effectiveness

The subjects scored pain intensity on a visual analogue scale (VAS) (0=no pain and 10=extreme, unbearable pain). Patients were instructed to point to the VAS. (Difference of 3-5 is considered as significant relief from tooth pain)

Results:

Data of this survey showed, among 288 subjects: (Female: 71% and male: 29%)

Effectiveness	Number of subjects
High	177
Moderate to low	59
No effectiveness	52

Females showed higher prevalence of dentinal hypersensitivity, 71% compared to males 29% in this survey.

Results of this survey showed greater effectiveness of in office clinical application of 8% arginine containing desensitizing paste among the maximum no. of the subjects.

Discussion:

Dentinal hypersensitivity (DH) is a problem that plagues many patients. In the majority of cases DH is chronic and recurring due to a given action, e.g. drinking cold beverages, eating hot used for treatment of DH are diverse, suggesting uncertainty among dentists about the best way to treat patients, as well as dissatisfaction with outcomes of available treatments.²³ The development of a therapy that can provide both immediate relief following professional application and a lasting desensitizing effect for a significant time period after use would be of great assistance to clinicians in dealing with DH.¹⁴

In this survey, 288 subjects were advised to use local application of desensitizing paste and in office checkup were done. The data showing the results

with higher effectiveness of paste in 177 subjects, moderate to low in 59 subjects and no change in 52 subjects. This had proven the clinical effectiveness of the desensitizing paste in instant relief to treat dentinal hypersensitivity. The essential components of the tested in-office desensitizing paste are arginine (an amino acid), bicarbonate (a pH buffer) and calcium carbonate (a source of calcium).²⁴ The significant reduction in DH after a single topical application in the present study confirms the results of previous clinical¹⁸⁻²² studies.

However, 52 subjects showed no change in clinical

effectiveness after single clinical application of this paste. Further studies are yet to be required to find the underline causative factors for no effectiveness of paste.

CONCLUSION

The in-office desensitizing paste containing 8% arginine and calcium carbonate provides significant reduction in dentin hypersensitivity instantly after a single professional application of the product and this reduction is maintained for 12 weeks without further application of arginine.

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