

**DESENSITIZING EFFECT OF SODIUM BICARBONATE (BAKING SODA)  
MOUTHWASH IN REDUCING DENTINAL HYPERSENSITIVITY AFTER  
ULTRASONIC SCALING****\*Dr. Komal Gaikwad**

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**INTRODUCTION**

Sodium bicarbonate commonly known as baking soda, is a chemical compound with the formula  $\text{NaHCO}_3$ , Composed of a sodium cation ( $\text{Na}^+$ ) and a bicarbonate anion ( $\text{HCO}_3^-$ ).

Baking soda was first recommended to be placed as a component of tooth powder by Dr. Jules Sarrazin, dean of New Orleans College of Dentistry in 1911, because of its ability to polish teeth without abrasion to the tooth or gingival.<sup>[1]</sup>

Sodium bicarbonate is easily available, low cost, less abrasive and also has antimicrobial property.

Dentine is a vital tissue, it is composed of millions of tubules, its diameter at dentino- enamel junction is 0.06  $\mu\text{m}$ , and 3.0  $\mu\text{m}$  at the pulpal wall, and most of these tubules are filled with fluid, an odontoblast process, collagen, and occasional non-myelinated pulpal nerves. These nerve fibers are in contact with the odontoblasts and act as mechanical receptors that cause pain. (Ten Cat 1998).<sup>[2]</sup>

“Dentin hypersensitivity is defined as short, sharp, well-localized pain arising from exposed dentin in response to stimuli, typically thermal, evaporative, tactile, osmotic or chemical and which cannot be ascribed to any other dental defect or pathology” (Holland 1997).

The pain is sharp and sudden, with 75% of people with hypersensitivity reporting pain upon application of a cold stimulus.

The establishment of healthy periodontal conditions by non-surgical periodontal treatment may result in a number of undesired side effects, such as, the gingival recession that leaves the root surface exposed to the oral environment (Badersten et al. 1984), and the iatrogenic denudation of root – dentine due to removal of the cementum layer by scaling and root planing procedures (Jacobson et al. 1994, Claffey 2004).<sup>[2]</sup>

The main cause of DH is gingival recession (receding gums) with exposure of root surfaces, loss of the cementum layer and smear layer, and tooth wear.

The term hypersensitivity represents a pathological situation in which treatment of the dentin hypersensitivity is essential.<sup>[5]</sup>

Various theories and mechanisms responsible for dentin hypersensitivity have been proposed for over a century.

Gysi in 1900 attempted to explain the hypersensitivity of teeth and described the movement of fluid in the dentinal tubules.<sup>[3]</sup>

The higher incidence of dentin hypersensitivity is seen in females than in males which can be contributed to hormonal influences and dietary habits, although the results are statistically insignificant. Dentin hypersensitivity may involve single tooth, group of teeth, area of the mouth or it can be generalized. The most commonly affected teeth are premolars and canine of both the arches, followed by maxillary first molars and incisors reported being the least sensitive. Cervical regions on the facial aspect are the most commonly involved areas.<sup>[4]</sup>

The theories of dentin hypersensitivity can be enumerated as follows:

- A. Odontoblastic transduction or odontoblasts receptor theory
- B. Direct innervation or neural theory
- C. Gate control theory
- D. Hydrodynamic or fluid movement theory

The iatrogenic denudation of root dentin due to removal of the cementum layer is yet another complication to scaling procedures (Jones et al. 1972, Van Volkinburg et

al. 1976, Jones 1987, Coldiron et al. 1990, Ritz et al. 1991, Zappa et al. 1991, Gantes et al. 1992, Jacobson et al. 1994).

A large number of dentinal tubules will, thus, be exposed, leading to direct avenues to the pulp for bacteria and bacterial elements present in the oral environment (Bergenholtz & Lindhe 1978).

As a result, the patient may experience increased sensitivity of the exposed root surfaces to thermal, tactile, evaporative and osmotic stimuli. This pain condition, when severe, has in the literature been termed dentin hypersensitivity (DH) (Bissada 1994, Haugen & Johansen 1988).<sup>[5]</sup>

Freshly exposed dentin in the coronal part of the tooth is more sensitive than cervical dentin. This may be due to the higher conduction velocity or structural differences in dentinal innervations and in the dentin structure itself. Hypersensitive dentin, however, is found most often in the cervical area.

Chronic dentin exposure may affect mineralization and inflammatory reactions in the pulp.<sup>[6]</sup>

#### AIM

To evaluate the effect of Sodium Bicarbonate mouthwash on reducing Dentinal Hypersensitivity (DH) after ultrasonic scaling.

#### MATERIAL AND METHODS

20 (male & female) subjects with DH after ultrasonic scaling were included in the study. Divided into two groups, Group A & Group B. 10 subjects in each group. Group A was instructed to rinse with sodium bicarbonate mouthwash twice a day. Group B was control group.

Hypersensitivity was recorded by

1. Visual analogue scale (VAS) method
2. Questionnaire method

Patients were randomly divided into 2 test groups. One group (A) of 10 patients asked to rinse the mouth by using ½ teaspoon sodium bicarbonate i.e. baking soda aqueous solution twice a day after regular brushing of teeth. Baking soda was dispensed in sachets by the department. Control Group (B) were not instructed to rinse with sodium bicarbonate.

Patients were examined for hypersensitivity by stimulating buccal or labial surfaces of exposed roots with

- (1) Water at 20° C;
- (2) A compressed air blast from an air syringe.

Responses was evaluated utilizing the Visual Analogue Scale (VAS) 1 week before ultrasonic scaling and 1, 2, 3 & 4 weeks following ultrasonic scaling.

#### Inclusion criteria

1. Patients who have recently undergone periodontal surgery.
2. Patients in good general health.
3. Age group 25-65 yrs.
4. Patients belonging to both the genders.
5. No tooth hypersensitivity treatment during last 6 months.

#### Exclusion criteria

1. Patients with systemic disease.
2. Mentally and physically challenged individuals.
3. Patients having any systemic infection during last 6 months.
4. Pregnant and lactating women.
5. Smokers and alcoholics.

Test for recording Dentinal Hypersensitivity

1. Cold air – cold air intensity score  
Application of cold air from a dental unit syringe was directed perpendicular to the exposed root surface after isolating the test tooth.

The subject was asked to rate the perception of sensitivity experienced during test as a score of 0 to 10 (where 0=no pain and 10=excruciating pain).

2. Cold water

The subject was asked to hold cold water in mouth for 30 seconds and The subject was asked to rate the perception of sensitivity experienced during test as a score of 0 to 10 (where 0=no pain and 10=excruciating pain).

All clinical measurement rerecorded at 2, 3 & 4 weeks.

#### RESULTS

In the present study the Sodium Bicarbonate was used to treat the dentinal hypersensitivity in 20 adult patients.

The effects of Sodium Bicarbonate were evaluated clinically and by using VAS method and Questionnaire method.

Table (1) shows the effects of Sodium Bicarbonate on dentinal hypersensitivity (Group A) at 1, 2, 3 and 4<sup>th</sup> week.

in group A than group B. using VAS scale and Questionnaire method with 1, 2, 3 and 4 week values as dependent variable and baseline values as covariates, the overall sensitivity score and cold air score test demonstrated a significant difference between group and a significant difference over 4 week study period.

Richard P et al studied that rinsing twice daily with a 3% potassium nitrate / sodium fluoride mouthwash may help reduce discomfort arising from dentinal hypersensitivity.

There are numerous studies describing the efficacy of sodium bicarbonate as an essential agent of the

dentifrices but limited literature is available on the effect of The present study was performed to check the desensitizing efficacy of Sodium Bicarbonate mouthwash on dentinal hypersensitivity.

Significant reduction in DH was reported in Group A which was instructed to rinse with Sodium Bicarbonate than in Group B which was not instructed to rinse with sodium Bicarbonate.

Sodium bicarbonate aqueous solution or baking soda mouthwash has reported to be highly effective in reducing dentin hypersensitivity.

Dentin hypersensitivity score was recorded using tactile test (mechanical stimulation using No. 23 explorer),

compressed air blast using three way syringe and thermal test using cold water. Each subject was assessed for dentin hypersensitivity using these three parameters and the pain response was recorded on Visual Analogue Scale (VAS).

The visual analogue scale (VAS) utilizes a line of 10 cm length anchored at the 2 extremes with descriptors representing the absolute minimum and the absolute maximum of pain a patient can experience from an external stimulus. In VAS assessments, the patient is asked to mark off the line such that it corresponds to the severity of the perceived pain and the pain intensity can be shown as an absolute value or as a percentage of the maximum.<sup>[4]</sup>

**Table 1 Group A**

Subject no	Test	1 week	2 week	3 week	4 week
1	Cold air	5	5	4	3
	Cold water	5	4	3	2
2	Cold air	4	4	3	2
	Cold water	6	5	4	3
3	Cold air	7	6	5	4
	Cold water	8	7	6	5
4	Cold air	6	5	4	3
	Cold water	7	6	5	4
5	Cold air	6	5	4	3
	Cold water	6	5	4	4
6	Cold air	7	6	5	3
	Cold water	6	5	4	3
7	Cold air	7	6	5	4
	Cold water	6	5	4	3
8	Cold air	8	7	6	5
	Cold water	7	6	5	4
9	Cold air	6	5	4	3
	Cold water	5	4	3	2
10	Cold air	6	5	4	3
	Cold water	6	5	4	3

**Table 2 Group B**

Subject no	Test	1 week	2 week	3 week	4 week
1	Cold air	7	6	5	5
	Cold water	8	7	6	6
2	Cold air	6	6	6	6
	Cold water	7	7	6	6
3	Cold air	7	6	6	6
	Cold water	7	7	6	6
4	Cold air	5	5	5	5
	Cold water	6	5	5	4
5	Cold air	7	6	6	6
	Cold water	6	6	6	6
6	Cold air	5	5	5	4
	Cold water	4	4	4	4
7	Cold air	8	8	7	7
	Cold water	7	7	6	6
8	Cold air	6	6	5	5
	Cold water	5	5	4	4
9	Cold air	6	6	5	5
	Cold water	7	7	6	6
10	Cold air	6	6	5	5
	Cold water	5	5	4	4

## DISCUSSION

The study was a clinical evaluation of desensitizing effect of sodium bicarbonate (Baking soda) mouthwash in reducing dentinal hypersensitivity after ultrasonic scaling.

Dentine sensitivity can be treated in different ways; first by reducing the dentinal tubules hypoconduction by occluding them; second, by reducing the nerve fibers excitability and by a combination of these two approaches. (Dondi et al. 1994, Tagami et al. 1994, Gillam & Orchardson, 2006).

Sonic and ultrasonic scaling techniques are widely used in periodontal prophylaxis. The vibration of sonic scaler inserts ranges between 3,000 and 8,000 cycles per second, while the vibration of ultrasonic scaler inserts operate between 18,000 and 45,000 cycles per second. Studies have confirmed that both techniques appear to attain similar results as hand instruments for removing plaque, calculus and endotoxin.<sup>[7]</sup>

Removal of plaque from tooth surfaces is an essential part of periodontal therapy. However, cleaning procedures may lead to a number of unintended side effects. For example, increasing the surface roughness of dental hard tissues and dentinal hypersensitivity.

The result showed that all 2 methods demonstrated a significant decrease in dentinal hypersensitivity sodium bicarbonate mouthwash and its use a desensitizing agent. Because of its numerous advantages such as biocompatibility, buffering capacity, low abrasivity, whitening properties, low cost and compatibility with the fluorides, baking soda was regarded as an ideal tooth powder to clean the teeth.

There are other many options for dentinal hypersensitivity treatment, as follows.

## LASER TREATMENT

Laser treatment has also been recommended for the treatment of dentin hypersensitivity. The treatment seems to be only transient, however, and the sensitivity returns in time. In order for a laser to actually alter the dentin surface, it has to melt and resolidify the surface. This effectively closes the dentinal tubules. This does not occur. It is felt that laser treatment reduces sensitivity by coagulation of protein and without altering the surface of the dentin.<sup>[8]</sup>

Dicalcium phosphate-bioglass in combination with Nd:YAG laser treatment has sealed dentin tubules to a depth of 10 mm, and dicalcium phosphate-bioglass plus 30% phosphoric acid occluded exposed tubules up to 60 mm (Richard D. et al).<sup>[3]</sup>

Neodymium-doped yttrium aluminium garnet (Nd:YAG) laser irradiation has been advocated for the alleviation of symptoms from dentine hypersensitivity. It is thought to

work by coagulation of proteins in the dentinal fluid, hence reducing permeability. It is also believed to create an amorphous sealed layer on the dentine surface that appears to be the result of partial meltdown of the surface.<sup>[9]</sup>

## FLUORIDE TREATMENT

Patients can apply stannous fluoride in a 0.4% gel or sodium fluoride in a 0.5% mouth rinse or a 1.1% gel. Fluorides reduce the permeability of dentin probably by precipitation of insoluble calcium fluoride inside the dentinal tubules and reduce sensitivity.<sup>[10]</sup>

Baking soda or calcium bicarbonate is a crystalline salt. The scanning electron microscopic images of teeth specimens treated with sodium bicarbonate have shown uniform amorphous crystalline deposition on the open dentinal tubules.<sup>[8]</sup>

Complete obliteration of dentinal tubules has been reported. As the crystal size is bigger than the tubules diameter baking soda crystals have not occluded the dentinal tubules the dentinal tubules by entering inside the opening. Repeated application of baking soda is advised to have sustained relief from dentin hypersensitivity.

Sodium bicarbonate is a highly biocompatible substance, which makes it safe for use in humans. Patients can be advised to use sodium bicarbonate aqueous solution as a mouthwash twice a day after periodontal therapy.<sup>[11]</sup>

Sodium bicarbonate improves taste and neutralizes acids and thus prevents erosion of tooth surface. The bland nature of sodium bicarbonate makes it tissue friendly even in patients with xerostomia and oral ulcers.<sup>[12]</sup>

In present study with all explanations discussed above sodium bicarbonate mouthwash seems to be more effective in reducing dentinal hypersensitivity after ultrasonic scaling.

DHS is a common dental complaint, and prior to treatment, a differential diagnosis is critical. The diagnosis is usually one of exclusion. Identification of the various risk factors should be ascertained, and a determination should be made of whether the pain is local or generalized. Eliminating or minimizing these risk factors should be accomplished prior to treatment. Unfortunately, most currently available tests are subjective; ideally, a more objective technique is required in order to adequately quantify the patient's response. Although many theories have been suggested over the past century, the hydrodynamic hypothesis that was initially proposed in the 1960s by Brännström remains the one that is usually accepted, but it is not totally clear. This is due to the complex nature of the odontoblasts, nerve endings, and fluid content of the tubules. It has been suggested that the odontoblasts,

which form the outermost layer of the dental pulp, act as sensory receptor cells.<sup>[13]</sup>

### CONCLUSION

Baking Soda is found to be effective in reducing dentinal hypersensitivity which was developed after ultrasonic scaling.

The results of present clinical study suggest that there was a general decrease in dentinal hypersensitivity levels in Group A.

There was also a statistically significant difference in decrease of dentinal hypersensitivity between the 2 groups, assessed by all 2 methods, following the 4 week treatment regimen.

It can therefore be suggested that rinsing twice daily with sodium bicarbonate mouthwash may help reduce discomfort arising dentinal hypersensitivity.

### REFERENCES

1. Sarrazin JJ. How to clean the mouth: thread, brushes, powders, washes and paste. *Oral Hygiene*, 1911; 1: 827-848.
2. Dina Al-Tayeb: Management of Root dentin Hypersensitivity Following Non surgical Periodontal Therapy: Clinical and Scanning Electron Microscopic study *Egyptian Dental Journal*, 54, 1: 15 July 2008.
3. Gysi A. An attempt to explain the sensitiveness of dentin. *Br J Dent Sci.*, 1900; 43: 865-868.
4. Bubteina N, Garoushi S. Dentine Hypersensitivity: A Review. *Dentistry*, 2015; 5: 330.
5. Tamaro, S., Wennstrom, J. L., & Bergenholtz, G. (2000). Root- dentin sensitivity following non-surgical periodontal treatment. *Journal of Clinical Periodontology*, 27(9): 690-697.
6. Trushkowsky RD, Oquendo A. Treatment of dentin hypersensitivity. *Dent Clin North Am.*, 2011; 55: 599- 608.
7. Drisko, C. L., et al, Sonic and ultrasonic scalers in periodontics. *Journal of Periodontology*, 71(11): 1792-1801.
8. Goodis HE, White JM, Marshall SJ, et al. Measurement of fluid flow through lasertreated dentine. *Arch Oral Biol.*, 1994; 9(Suppl): 128S.
9. West NX. Dentine hypersensitivity: preventive and Therapeutic approaches to treatment. *Periodontol* 2000. 2008; 48: 31-41.
10. Morris MF, Davis RD, Richardson BW. Clinical efficacy of two dentin desensitizing agents. *Am J Dent*, 1999; 12(2): 72-6.
11. Vasundhara R et al Comparative Evaluation of Fluoridated Mouthwash and Sodium Bicarbonate in Management of Dentin Hypersensitivity: An In Vitro SEM Study.
12. Walsh LJ. Preventive dentistry for the general dental Practitioner. *Aust Dent J.*, 2000; 45: 76-82.
13. Trushkowsky RD, Oquendo A. Treatment of dentin Hypersensitivity. *Dent Clin North Am.*, 2011; 55: 599- 608.