Review Article

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# DENTINAL HYPERSENSITIVITY: A PROMISING TREATMENT APPROACH

Arun Verma[1] ,Shruti Khanna[2]
1.Professor
2.Post Graduate Student

## ABSTRACT:

The pain response varies substantially from one person to another. The condition generally involves the facial surfaces of teeth near the cervical aspect and is very common in premolars and canines. The most widely accepted theory of the pain is Brannstrom's hydrodynamic theory, fluid movement within the dentinal tubules. The dental professional, using a variety of diagnostic techniques, will discriminate such condition from other conditions that may causes sensitivity in teeth. Treatment of the condition can be invasive or non-invasive depending on nature of severity.

**Keywords:** odontoblast, stimuli

## INTRODUCTION:

Dentine hypersensitivity has been defined as a short, sharp pain arising from exposed dentine in response to stimuli - typically thermal, evaporative, tactile, osmotic or chemical - and which cannot be ascribed to any other dental defect or disease (Canadian Advisory Board on Dentine Hypersensitive Teeth, 2003).[1-5]

Even after long periods of exposure to the oral environment, dentinal sensitivity may still be a significant problem despite the exposed tubules becoming occluded by the smear layer or pellicle. Thus, once sensitivity has become established the pulp may become irreversibly sensitive. Treatment is therefore aimed at not only restoring the original impermeability of the tubules by occluding them, but also controlling the neural elements within the pulp to dampen the external stimulatory effects. These two modes of control are either partial or total obliteration of the dentinal tubules or alteration of pulpal sensory activity, or both.

Patency of tubules and vitality of the pulp can be determined by blowing a gentle air stream on the tooth in question for 0.5 to 1 second while covering the adjacent teeth with gloved fingers. Nonvital teeth or impermeable dentin do not respond to air blasts.[6-15]

**Epidemiology**

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|---|---|
| Incisors | 26% |
| Canine | 29% |
| Premolars | 38% |
| Molars | 12% |

Occlusal/buccal sites are also now becoming more frequently affected in young adults, probably as a result of dental

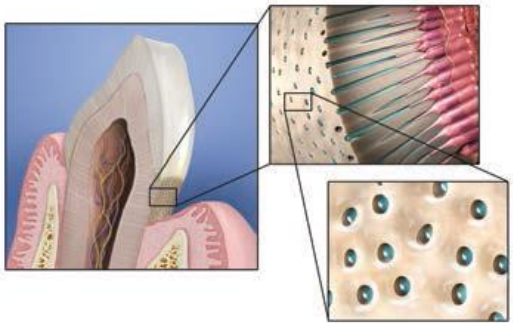
*Corresponding Author Address: Dr. Shruti Khanna Email: shruti08khanna@gmail.com

wearing caused by a combination of erosion and abrasion (Jaeggi and Lussi 2006). Dentine hypersensitivity can present at any age, but the majority of individuals range in age between 20 and 50 years with a peak in prevalence in the age range 30-39 year (Cummins 2009).

It has been reported that there is a slightly higher incidence of dentine hypersensitivity in females compared to males. This difference is, however, not statistically significant. The relationship between dentine hypersensitivity and ageing is unclear. It has been suggested that with the lifespan of the general population increasing, and more people keeping their teeth longer, hypersensitivity will increase in prevalence. This seems to make sense on the basis that gingival recession and loss of enamel and cementum is more prevalent in older individuals. The above assumptions are somewhat confounded by reports in the literature which indicate that most sufferers of dentine hypersensitivity range in age from 20 to 40 years with the peak incidence occurring at the end of the third decade and decreases during the fourth and fifth decades of life.[16-23]

## Theories for dentinal hypersensitivity

**Odontoblastic transduction theory:** According to this theory, odontoblastic processes are exposed on the dentine surface and can be excited by a variety of chemical and mechanical stimuli. As a result of such stimulation neurotransmitters are released and impulses are transmitted towards the nerve endings. To date no neurotransmitters have been found to be produced or released by odontoblastic processes.



**Neural theory:** As an extension of the odontoblastic theory, this concept advocates that thermal, or mechanical stimuli, directly affect nerve endings within the dentinal tubules through direct communication with pulpal nerve fibres. While this theory has been supported by the observation of the presence of unmyelinated nerve fibres in the outer layer of root dentine and the presence of putative neurogenic polypeptides, this theory is still considered theoretical with little solid evidence to support it.

**Hydrodynamic theory:** By far the most widely accepted theory for dentinal hypersensitivity is the hydrodynamic theory proposed by Brannstrom and co-workers. This theory postulates that fluids within the dentinal tubules are disturbed either by temperature, physical or osmotic changes and that these fluid changes or movements stimulate a baroreceptor which leads to neural discharge. The basis of this theory is that the fluid filled dentinal tubules open to the oral cavity at the dentine surface as well as within the pulp. In general, the excitement of nerve fibres by different kinds of stimuli can be explained by the hydrodynamic theory. For example,

dehydration associated with desiccation following air movement over the exposed dentine surface results in outward movement of dentinal fluid towards the dehydrated surface, which triggersnerve fibres and results in a painful sensation.[24-27]

## How to measure hypersensitivity??

**Thermal:** A simple thermal method for testing for tooth sensitivity is directing a burst of room temperature air from a dental syringe onto the test tooth. Blowing air on a tooth involves drying and pain can be easily detected by this method if the teeth are sensitive. Air stimulation has been standardized as a one – second blast from the air syringe of a dental unit, where its temperature is set generally between 65 – 70 degrees fahrenheit and at a pressure of 60 psi. An air thermal device has been devised8. Instruments that involve electric cooling or heating of direct contact metal probes have also been used in some studies

**Osmotic:** An osmotic method consisting of the subjective pain response to a sweet stimulus was used to measure the effect of several test dentifrices on dentinal sensitivity

**Sensitivity in cases of bleached teeth:** Tooth whitening has become an extremely popular procedure that has left the dental office and gone “over-the-counter” as many different consumer products have been marketed. All of these products contain either hydrogen peroxide or compounds that break down to hydrogen peroxide (ie, sodium perborate or carbamide peroxide). While the popularity of tooth bleaching is expanding exponentially, a common side effect of external tooth bleaching is tooth sensitivity.

The osmolarities varied from 4,900 mOsm/kg to 55,000 mOsm/kg. Because plasma and extracellular fluids have osmolarities of 290 mOsm/kg, these bleaching gels are all extremely hypertonic and would tend to osmotically draw water from pulp, through dentin and enamel, and into the bleaching gels. This might hydrodynamically activate intradental nerves.[28-31]

**Differential Diagnosis**

- Dental caries.
- Cracked tooth syndrome.
- Fractured restorations.
- Post-restorative sensitivity.
- Chipped teeth.
- Teeth in acute hyperfunction.

## Treatment protocols for dentinal Hypersensitivity

1. **Nerve desensitization**

Potassium nitrate

2. **Anti-inflammatory agents**

Corticosteroids

3. **Cover or plugging dentinal tubules**

a. Plugging (sclerosing) dentinal tubules

- Ions/salts
- Calcium hydroxide

- Ferrous oxide
- Potassium oxalate
- Sodium monofluorophosphate
- Sodium fluoride
- Sodium fluoride/stannous fluoride combination
- Stannous fluoride
- Strontium chloride
- Protein precipitants
- Formaldehyde
- Glutaraldehyde
- Silver nitrate
- Strontium chloride hexahydrate
- Casein phosphopeptides
- Burnishing
- Fluoride iontophoresis

b. Dentine sealers

- Glass ionomer cements
- Composites
- Resins
- Varnishes
- Sealants
- Methyl methacrylate

c. Periodontal soft tissue grafting

d. Crown placement/restorative material

e. Lasers

## CONCLUSION

Dentinal hypersensitivity is a very common condition which has been managed by agents and formulations applied locally, either “in office (iontophoresis, resins, restorations, burnishing of dentin)” or “at home (available in the form of gels, cream or oral rinse)”. The patient should be responsible for the decision making process since some of their daily habits may be contributing to the problem and if not changed the condition will persist.For products developed for personal application at home, potassium nitrate, stannous fluoride, sodium fluoride, sodium monofluorophosphate and strontium chloride have been found to be safe to use and beneficial to patients in combating this condition.

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