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## MANAGEMENT OF SENSITIVITY AFTER DENTAL BLEACHING- A REVIEW

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### Abstract

**Aim** - To review the various methods to manage sensitivity of teeth caused due to bleaching.

**Objective** - To provide better understanding about the various methods adopted to relieve tooth sensitivity after undergoing dental bleaching.

**Background** - Tooth bleaching is one of the most conservative dental treatments to improve the persons aesthetic appearance. Hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>), the active principle in bleaching agents, reacts with dental enamel on contact and produces oxygen, in the form of free radicals, and water. Because of the low molecular weight of free radicals, as well as the porous nature and selective permeability of enamel, the free radicals pass into dentin and through the dentinal tubules, to the pulp. This ultimately results in dentinal hypersensitivity. The bleaching induced sensitivity can be treated by the use of agents causing occlusion of the dentinal tubules or inhibiting the nerve stimulus by the use anti inflammatory drugs.

**Reason** -Dental bleaching is a trending dental procedure used for aesthetic purposes but side affects like sensitivity must be minimized and eliminated. This review emphasizes on the various methods adopted to treat hypersensitivity and the precautionary measures.

**Key Words** – Dentine sensitivity, bleaching, flourides, hydrogen peroxide, hypersensitivity.

### Introduction

In today's beauty- oriented modern society a good smile and teeth are the most important aspects of an attractive face[1]. As a result, dentistry today offers multiple cosmetic procedures ranging from conservative non-restorative treatment to more invasive restorative methods to improve esthetics[2,3]. Reports show that patients prefer conservative treatment

methods as it does not involve loss of tooth structure thus making bleaching one of the most popular services[4,5].

Current tooth bleaching materials are based primarily on either hydrogen peroxide or carbamideperoxide[6,7]. The whitening action of these chemicals is by the decomposition products which break the organic and inorganic molecules into smaller particles changing their optical structure and reducing their absorption of light [6,8].

Despite its excellent cosmetic results , a common side effect of bleaching is dentin hypersensitivity [9,10], which occurs mostly due to the easy penetration and passage of the decomposition products through the enamel, dentin and pulp. The sensitivity arising from such a condition may contribute to a permanent damage [11].

The practice of teeth whitening began around 4000 years ago with the ancient Egyptians, who created a whitening paste using ground pumice stone mixed in wine vinegar. White teeth were a mark of beauty and a sign of wealth. Ancient Romans whitened their teeth using urine. The ammonia in the urine was the bleaching agent. During the 17<sup>th</sup> century, people relied on their barbers for the care of hair and teeth. The barber would file down the teeth and apply an acid that would whiten them. While the practice made teeth whiter, it eroded tooth enamel and lead to decay. In 1887 oxalic acid was proposed for whitening followed by calcium hypochlorite. Peroxide was first used for tooth whitening in 1884[12]

### **Dental Bleaching and Its Action On The Teeth**

Teeth bleaching can be defined as the whitening (or lightening) of a single tooth or multiple teeth via the application of an external agent or agents. Teeth bleaching or whitening can be achieved by either “over- the-counter” methods, or by seeing your dentist. Most currently used bleaching agents employ superoxol, McInnes solution, modified McInnes solution and hydrogen peroxide, either directly or as the product of a chemical reaction with carbamide peroxide or sodium perborate.[13,14].

The bleaching mechanism of hydrogen peroxide is carried out by its decomposition products which includes free radicals, reactive oxygen molecules, and peroxide anions which bind to organic or inorganic molecules including chromophores [6,7]. The free radicals that bind to the chromophores break them through oxyreduction transforming them into smaller, lighter colored, and lower molecular weight molecules changing their optical structure and reflecting less light thereby resulting in reduction or elimination of the discoloration[6,8].

The level of penetration of the bleaching agents may depend upon various factors like thickness of the enamel and dentin, exposure of the tubules etc. The hypersensitivity caused due to the dental bleaching may be a dental pain which is

sharp in character and of short duration, arising from exposed dentin surfaces in response to any kind of stimuli. The most common dentin hypersensitivity theory is Brannstrom's theory of hydrodynamics. It clearly states the cause of dentin hypersensitivity as a relationship between the permeability of dentinal tubules and painful symptoms[12]. The pain is felt when any of the above mentioned stimuli causes a disturbance of the dentinal tubular fluid which stimulates the baroreceptors of the pulpal nerves responsive to pain[16,17]. However, dentin sensitivity associated to bleaching is caused due to the penetration and passage of the decomposition products through the dentinal tubules to reach the pulp. The sensitivity arising from such a condition may contribute to reversible pulpitis..

Though bleaching is considered an effective method to whiten teeth there are a few contraindications such as extremely large pulp chambers, severe loss of enamel, teeth with composite restoration, teeth exhibiting gross or microscopic enamel cracking, hyperemia associated with orthodontic tooth movement and other causes of hypersensitivity such as exposed root surfaces.

### **Adverse Affects of Bleaching**

Dentin hypersensitivity is one of the most common side effect reported by patients who have undergone teeth whitening[18]. In this case, we believe that changes to the pulp from the bleaching process are directly associated with the ability of the whitening agent to reach the pulpal bed by penetrating into dental tissues, with pulpal inflammation being the result of this percolation[19,20]. The sensitivity arising from such a condition can contribute to reversible or irreversible pulpal changes.

Damage to the pulpal tissues can lead to the release of cell derived factors such as prostaglandins and adenosine triphosphate which excite or sensitize the pulpal nociceptors resulting in the release of certain inflammatory mediators[21,22]

Such as eicosanoids-bioactive lipid. These inflammatory mediators are derived from the polyunsaturated arachidonic acid, due to the action of the cytosolic phospholipase A2 enzyme (PLA2 is an enzyme that is regulated in response to mutagenic or inflammatory stimuli) in the membrane phospholipids. Arachidonic acid can be metabolized by two large classes of enzymes, cyclooxygenase (COX) and lipoxygenase[23]. COX is responsible for the formation of various prostaglandins and thromboxane. Production of COX2 would contribute to inflammation and pain, thus these substances play a critical role in the pathogenesis of pulp disease[24].

Pulpal inflammation is a complex process that involves both neural and vascular reactions. Neuropeptides are an important neural component that are present in the sensitive afferent neurons of the trigeminal ganglia and in the sympathetic fibers of the cervical ganglia[25].

These neuropeptides are responsible for histamine release, the induction of vasodilatation, the increase of pulpal blood flow and consequently, a more rapid and wider access by inflammatory cells and mediators to the inflammation site. This process can generate an inflammatory response and may induce apoptosis of pulp cells[25].

### **Managing The Hypersensitivity**

A thorough examination should precede any bleaching treatment so that any pre-existing sensitivity can be identified and addressed before bleaching[26,27]. Spending sufficient amount of time with the patient explaining the bleaching process and educating them regarding the potential for sensitivity is the key to their compliance and willingness to bleach

Sensitivity can be managed through two methods , either by using a material that can interfere with the transmission of the pain stimulus or by using a material that can exert a blocking effect on the open dentinal tubules. Several topical agents can be used to reduce sensitivity. The most commonly used agent for professional application are fluorides.[28]

Topical fluoride- Fluorides act by occluding the dentinal tubules through crystallization and reducing the fluid flow to the pulp, thereby reducing sensitivity[28]. Topical fluorides are applied either as a gel in a tray or as a varnish depending on the number of teeth affected.

Oxalate or strontium salts - These materials are applied in a rubbing or burnishing motion and act by exerting a blocking effect on the open dentinal tubules similar to the fluorides.

Stannous fluoride - By hydrolysis and oxidation reactions, it forms insoluble metal salts that form a precipitate over the tubules, blocking them.[29]

Other tubule-occluding agents new to the market include arginine with calcium carbonate (Pro-Argin™), strontium acetate, and calcium sodium phosphosilicate (Novamin®).

### **Preventive Measures and Care For Teeth**

An ounce of prevention is worth a pound of cure. There are several factors that play a part, including genetics, what kind of food and drink you consume and how well one practices oral hygiene. The enamel and dentin is what play the biggest role in color. Certain food and drinks will directly stain the enamel and break down the enamel, and weaken enamel with

age. As the enamel breaks down, it reveals the yellow dentin underneath. To figure out how to whiten our teeth, the cause for the discoloration should be first identified . If the cause for stain is the food and drinks consumed, then there are natural remedies which will help whiten teeth without the risk of causing sensitivity due to bleaching[30].

1) Baking soda and lemon juice paste : Sodium bicarbonate is mildly abrasive, gently scrubbing away the surface stains to return teeth to a whiter shade. Its also very alkaline which helps balance out the ph of acidic foods , it also reduces the acidity of lemon juice, which acts as a natural bleach.

2) Strawberry, salt and baking soda scrub : Strawberries are high on vitamin C, which can help break-down plaque that is causing your teeth to look yellow. It also has an enzyme called maleic acid, which may help to remove surface stains. The salt and baking soda acts as an abrasive portion of the paste physically scrubbing away stain-causing gunk.

3) Coconut oil rinse: also known as oil pulling, it's a unique, old, remedy that helps whiten teeth. The lauric acid in coconut oil helps get rid of the bacteria found in plaque that can make them yellow. It also helps promote gum health and keep your breath fresh.

However, the presence of bleaching induced sensitivity can be controlled by the use of certain agents . They may include Desensitizing toothpastes are the most commonly used self-applied approach to treating sensitive teeth, these toothpastes contain potassium salts. Potassium ions pass easily through the enamel and dentinal tubules to the pulp and act by interfering with the transmission of stimuli by depolarizing the nerve surrounding the odontoblast process[31 ].

Natural methods to manage sensitivity include avoiding acidic foods and drinks, use of soft bristled brush, use of fluoride rinse, avoiding rigorous brushing

## **Conclusion**

Cosmetic dentistry is growing in big ways and transforming dental practices. Teeth whitening being one of the main cosmetic requirement, bleaching has gained a lot of importance over the years. Although sensitivity remains the main adverse effect, there are effective methods to prevent, decrease or eliminate the problem for most patients. Treatments may range from simple topically applied medicaments at home by the patients to restorations , pulp removal or mucogingival surgery depending on the severity and extent of sensitivity[32]. Potassium nitrate and fluoride containing bleaching agents have shown positive results in preventing and reducing the potential for sensitivity which allows patients to continue whitening to successful completion.

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