

The Art And Science Of Tooth Whitening: Review With Case Reports

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Abstract: Dental bleaching, also known as tooth whitening, is a common procedure in general dentistry but most especially in the field of cosmetic dentistry. As a person ages the adult teeth often become darker due to changes in the mineral structure of the tooth, as the enamel becomes less porous. Teeth can also become stained by bacterial pigments, food-goods and tobacco. Certain antibiotic medications (like tetracycline) can also cause teeth stains or a reduction in the brilliance of the enamel.

Tooth bleaching is not a modern practice. Bleaching of discolored, pulpless teeth was first described in 1864 and variety of medicament such as chloride, sodium hypochlorite, sodium perborate and hydrogen peroxide has been used, alone or in combination, with or without heat activation.

The Walking Bleach technique was introduced in 1961, involving placement of a mixture of sodium perborate and water into pulp chamber. This technique was modified and water was replaced by 30-50% H₂O₂. Now, the popular technique night guard vital Bleaching technique describes the use of 10% carbamide peroxide in mouth guard to be worn overnight for lightening tooth color.

This article presents clinical cases in which different bleaching modalities have been used to successfully treat unsightly teeth. Depending upon the type and severity of discoloration, in-office vital and nonvital bleaching procedures were carried out. Discoloration of a single tooth has been managed using nonvital bleaching alone or with a combination of other minimally invasive modalities for an acceptable esthetic outcome. The case selection was done by considering the patient's needs and expectations, the type and cause of discoloration and patient economics. Moreover, prime importance was given to the conservation of the existing tooth structure and acquiring a complete change in the shade of teeth, which was comparable to that of the adjacent teeth. The desire to have a bright smile has become an important esthetic need of patients. The article explores various forms of bleaching and their successful usage in day-to-day clinical practice.

Keywords: Superoxol (30% H₂O₂), nonvital bleaching, 16% carbamide peroxide gel

I. INTRODUCTION

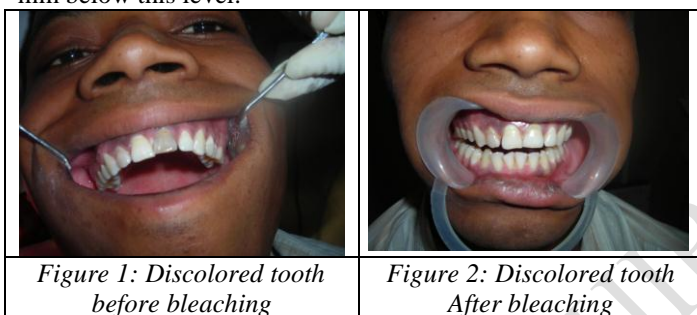
According to the FDA, whitening restores natural tooth color and bleaching whitens beyond the natural color. There are many methods to whiten teeth, such as brushing, bleaching strips, bleaching pen, bleaching gel, laser bleaching, and natural bleaching. Traditionally, at-home whiteners use overnight trays containing a carbamide peroxide gel which reacts with water to form hydrogen peroxide. Carbamide peroxide has about a third of the strength of hydrogen

peroxide. This means that a 15 percent solution of carbamide peroxide is the rough equivalent of a five percent solution of hydrogen peroxide. Over the counter kits whiten with small strips that go over the front teeth. The peroxide oxidizing agent penetrates the porosities in the rod-like crystal structure of enamel and bleaches stain deposits in the dentin. Power bleaching uses light energy to accelerate the process of bleaching in a dental office. The effects of bleaching can last for several months, but may vary depending on the lifestyle of the patient. The successful outcome of any of the applied

modalities mainly depends on the etiology, diagnosis and proper selection of bleaching materials and the correct clinical technique. (1, 2).

II. CASE REPORTS

Case I: A 26 year-old male reported to the Department of Conservative Dentistry, Endodontics and Aesthetic Dentistry with a discolored maxillary left central incisor [Figure 1a] and felt conscious due to the unsightly appearance of the tooth and demanded an improvement in his esthetic appearance. The patient presented a history of trauma to the upper anterior region 2 years ago. The treatment protocol followed in this case was root canal treatment followed by using superoxol (30% hydrogen peroxide). Thorough oral prophylaxis was done, and clinical photographs were taken. Root canal treatment was performed for the maxillary left central incisor. In the next appointment, excess Gutta-percha was removed from the access cavity, and it was cleaned. The height of clinical crown was measured with a periodontal probe, and it was made sure that Gutta-percha is removed approximately 2 mm below this level.



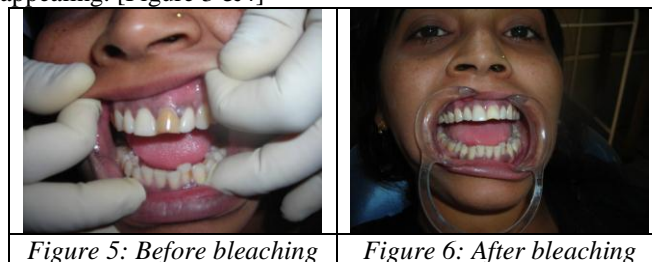
The pulp chamber was dried with cotton and blast of hot air. Completely fill the pulp chamber with loosely packed cotton moistened with Superoxol, but do not allow the bleach to drip from the on the tooth. Turn on the lamp and apply the heated round condenser on the cotton moistened with Superoxol. Now take few fiber of cotton and place it on the labial surface of the tooth and again apply heated instrument on it. After five minutes remove the cotton from pulp chamber and remoisten it with Superoxol, replace it in the pulp chamber apply heat to it. Repeat this procedure for another five minutes. After three such applications of the bleach a cotton pellet moistened with Superoxol was sealed in the chamber and then covered with cavat.

After two non-vital bleaching sessions, a complete metamorphosis of the discolored tooth was evident and the present color was comparable to that of the adjacent teeth. Post-obturation restoration was done using composite resin.

Case II: A 28-year-old female reported to the department with a chief complaint of unsightly and short teeth, and she desired an improvement in her esthetic appearance. Patient presented a history of trauma to the upper anterior region 6 years ago. Clinical examination revealed discolored maxillary left central incisor. The treatment protocol followed in this case was root canal treatment followed by bleaching using Superoxol (30% hydrogen peroxide). The surface of the pulp chamber was freshened with bur removing all visible stains without impairing the strength of the tooth. A few wisps of

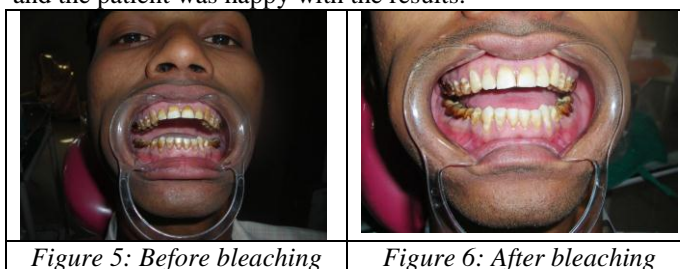
cotton are placed in the pulp chamber to form a matrix for holding the Superoxol solution. The labial surface of the tooth is covered in the same manner. The Superoxol solution was then applied by means of a small syringe mounted with platinum needle. Heat from a heated plastic instrument was applied to activate the bleaching solution. After five minutes, the cotton was removed and pulp chamber was dried before inserting a new wisp of cotton and a fresh supply of Superoxol. The procedure was repeated for six periods of five minutes each or for a total of from twenty to thirty minutes. After drying the canal, a pledget of cotton moistened with Superoxol was sealed in the pulp chamber by means of zinc phosphate cement.

After 4 non vital bleaching sessions the discoloration of the tooth was not evident and the tooth was esthetically appealing. [Figure 3 &4]



CASE 3

A young man aged 25 years reported to the department of conservative dentistry and endodontics with the complain of discoloration of his entire dentition since childhood. His history showed that his siblings too have the same problem on examination typical tetracycline stains were seen hence home bleaching technique/night guard vital bleaching technique was planned. Custom bleaching trays were prepared and 16% carbamide peroxide gel was used in this case. The patient was shown how to place the gel in the custom made bleaching tray. He was asked to wear the tray overnight because overnight use causes decrease in loss of material due to decrease salivary flow at night and decreased occlusal pressure. The patient was called after a week. The patient's main concern was whitening of upper and lower anteriors only, so he applied carbamide peroxide gel in canine to canine region of upper anteriors as well as canine to canine in the lower anteriors after using the trays for four weeks drastic change was seen in his aesthetics and the patient was happy with the results.



III. DISCUSSION

The desire to have white teeth and thus a more pleasant smile has become an important esthetic need of the patients

today. Various in-office vital bleaching techniques are effective for teeth with generalized discoloration.(3,4) A single discolored anterior tooth in some patients may stand out and majorly influence the esthetics of smile and thus the confidence of many people. Intracoronary bleaching of nonvital teeth involves the use of chemical agents within the coronal portion of an endodontically treated tooth to remove tooth discoloration.(5)It may be successfully carried out at various times, even many years after root canal therapy and discoloration.

Tooth colored bleaching today is based upon Hydrogen Peroxide as an active agent. Hydrogen Peroxide may be applied directly or produced in a chemical reaction from sodium perborate or carbamide peroxide. Hydrogen Peroxide acts as a strong oxidizing agent through the formation of free radicals, reactive oxygen molecules and hydrogen peroxide anions. These reactive molecules attack the longchained, dark colored chromophore molecules and split them into smaller, less colored and more diffusible molecules.

Carbamide peroxide also yields urea which is further decomposed to CO₂ and ammonia. It is the high pH of ammonia which facilitates the bleaching procedure. There are many methods to whiten teeth, such as brushing, bleaching strips, bleaching gels, laser bleaching and natural bleaching.

There are many popular natural ways with which one can whiten one's teeth. Most, if not all, natural whitening methods are extremely inexpensive, especially if compared to artificial methods, which can be extremely expensive. Some natural teeth whitening methods can be very gentle in the teeth, while others can lead to enamel damage. One efficient type of natural teeth bleaching is through the use of malic acid (6, 7), a natural occurring acid in fruits that contribute to their pleasantly sour taste and is made by all living organisms. One simple way of natural tooth bleaching is by applying the pulp of crushed strawberries (which contains malic acid) to the teeth and leaving it there for five minutes. Remaining of strawberry pulp can be removed by flossing the teeth. Another way is by gently and circularly brushing one's teeth with some baking soda (an abrasive teeth whitener) using a soft toothbrush. Malic acid as well as baking soda are both effective whitening treatments, but should be used sparingly as both methods are not too gentle on the teeth, and could lead to enamel damage if used indiscriminately (i.e. more than a couple of times a week or so). Apples, celery and carrots also support and help whitening teeth (8) as they act like natural stain removers by increasing saliva production (the mouth's natural self-cleaning agent) and scrub the teeth clean. They also help maintaining a fresh breath by killing bacteria that produces halitosis. The juice of apples, especially green apples, also contains malic acid (being malic derived from the Latin word for apple *mālum*, as the acid was named after it). Lemons are sometimes used as a teeth whitening agent by squeezing its juice on the teeth and lightly brushing for a couple of minutes. Extreme caution should be exercised with this method as the high acidity of lemon can easily damage the enamel, much more so if it is not promptly rinsed out completely with warm water. Hydrogen peroxide, while not a food product and not strictly a natural solution, is the main ingredient of most commercial and professional dental whitening products. A solution of 3-percent of hydrogen

peroxide can be used as a teeth bleaching mouthwash, but be sure to spit it all and preferably not swallow any of it. A whitening toothpaste can be made by mixing one tablespoon of baking soda with two tablespoons of hydrogen peroxide. While some cheaper commercial whitening toothpastes do have baking soda (sodium bicarbonate) as the whitening ingredient, is not recommended for one to use a baking soda based toothpaste everyday for long periods (for the aforementioned damaging effect sodium bicarbonate may have on one's teeth).

RISKS

Side effects of teeth bleaching include, but are not limited to:

- ✓ Chemical burns from gel bleaching (if a high-concentration oxidizing agent contacts unprotected tissues, which may bleach or discolor mucous membranes), sensitive teeth
- ✓ Over bleaching known in the profession as "bleached effect", particularly with the intensive treatments (products that provide a large change in tooth color over a very short treatment period, e.g., 1 hour)
- ✓ Pain if you have "sensitive teeth" caused by open dentinal tubules.
- ✓ Risk of increased hot/cold sensitivity.
- ✓ Gingival and soft tissue irritation

IV. SUMMARY AND CONCLUSION

Although a wide arena of esthetic restorative materials are available to us today for the management of discolored anterior teeth, bleaching still remains a viable option in certain cases. A number of factors play an important role in deciding the treatment plan. The patient-related factors for a successful treatment outcome are the patient's needs, age, expectations and affordability. The clinician-related factors include the availability of bleaching materials and a thorough knowledge of the material science, including methodologies and techniques involved. (9, 10)

Nonvital bleaching also can be an esthetically pleasing and minimally invasive option for young patients rather than a complete coronal coverage. Intracoronary bleaching of nonvital teeth involves the use of chemical agents within the coronal portion of an endodontically treated tooth to remove tooth discoloration.(11) It may be successfully carried out at various times, even many years after root canal therapy and discoloration. The successful outcome depends mainly on the etiology, correct diagnosis and proper selection of bleaching technique.

Moreover depending upon the clinical condition, a synergistic approach of combining bleaching with other modalities such as micro-abrasion and composite veneers can help in gaining an excellent clinical outcome. Taking into account the increasing esthetic demand of the patients, this approach proves to be conservative and simple for the successful management of unsightly teeth. (12).

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