

Dental Bleaching: How Far Distance between Patient Demands and what Actually Achieved

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Abstract

Background: The desire of many people to have a brilliant smile with shiny and sparkling bright teeth has continued to push individuals into seeking dental bleaching services. Numerous teeth whitening products and procedures are currently available in the market. There are a variety of bleaching techniques which include: in-office procedures and home treatments. The results of both are generally successful, although a common side effect is an increase in tooth sensitivity.

Objectives: The purpose of this review is to evaluate the advantages and disadvantages of Bleaching.

Methodology: Data was collected through the related articles published in the last ten years in PubMed indexed journals.

Conclusion: The knowledge and skills of the dentists are critical determinants of the attainment of desired treatment outcomes.

Keywords: Bleaching Devices; Advantages of Teeth Bleach; Tooth Sensitivity

Introduction

The desire of many people to have a brilliant smile with shiny and sparkling bright teeth has continued to push individuals into seeking dental bleaching services. Numerous teeth whitening products and procedures are currently available in the market [1]. Unlike laser treatment, dental bleaching is considered as one of the most cheaper and effective teeth whitening treatment method. Usually, most of the smokers have stained teeth that may require bleaching solutions. In some cases, individuals fail to observe dental hygiene resulting into formation of discolored teeth [2]. Even though it is recommended for individuals to seek medical advice from a qualified and practicing dentist before opting for any dental bleaching solutions, the majority of people tend to disregard such critical requirements. Therefore, the purpose of this review is to evaluate the advantages and disadvantages of Bleaching.

Materials and Methodological Approach

The selection of the targeted resources, the search involved identifying articles with pros and cons of various treatment methods of dental bleaching. The exclusion of randomized controlled trials (RCTs) entailed excluding studies that focus on the perceived benefits of conventional methods of conducting dental bleaching as well as studies that focused primarily on home-based dental bleaching methods.

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The extraction of resources relied mainly on the primary database in nursing, CINAHL. The articles were identified by abstract and title in tandem with the previous described search approach. Resources meeting the inclusion criteria were used in the creation of the content of this research paper. The key words used in the identification of resources from the selected primary database include terms such as dental bleaching, dental whitening, advantages and disadvantages of dental bleaching, methods of dental bleaching, vital and non-vital teeth bleaching. More than thirty articles resulted in the search. However, only articles meeting the preset protocols were selected for this review.

Qualitative assessment

Brief bleaching history

The practice of dental bleaching finds its way back in more than 4000 years ago, especially among the Egyptians. The method leveraged on the mixture of pumice and wine vinegar. White teeth signified wealth and beauty among the Egyptians. Various methods were used for dental bleaching [2]. For instance, Ammonia were largely used as bleaching agent. In the better part of the 17th century, individuals mainly relied on their barbers to provide them with acids that were effective but had adverse effects on the enamel. Discovery of fluoride was made in the 19th century.

Most significantly, over-the-counter (OTC) bleaching agents featured in the US-based markets as early as 1990s with low concentration of hydrogen peroxide or carbamide peroxide. The agents were used in home-based settings [3]. In the 1960s, oral antiseptic and Glyoxide were discovered; the at-home bleaching techniques. However, the contemporary bleaching gels have enhanced levels of hydrogen peroxide concentrations (15 - 40%). Sometimes the agents are used with the help of light or rubber dam isolation to facilitate the achievement of desired results.

Methods of dental bleaching

According to Martin., *et al.* (2013) [4], most of the methods of dental bleaching rely on the use of hydrogen peroxide (H₂O₂) or carbamide peroxide, a precursor of hydrogen peroxide. The chemical, hydrogen peroxide, produces free radicals that affect the bleaching action. The free radicals which are composed of water and oxygen molecules in the purely aqueous state tend to be relatively and acidic and reactive. The production of perhydroxyl is one of the most reactive radicals produced during the bleaching process¹. Maintenance of low levels of alkalinity of the hydrogen peroxide is crucial in the formation of ions of perhydroxyl. The production of a large amount of perhydroxyl free radicals results into an increased rate of bleaching action within the reduced duration. In most of the research studies, a concentration of 35% of hydrogen peroxide is usually used to carry out the dental bleaching procedures². According to De Geus., *et al.* (2018), peroxides diffuse through the pulp depending on the concentration of the bleaching agent and the length of time during the application of the substance. Other conditions that facilitate the penetration of the bleaching agents into the pulp include abnormalities on the surface of the enamel.

Types of stains

Numerous factors account for the appearance and coloration of teeth. The assessment of the causes of coloration is critical in determining the most suitable treatment option as well as the extent of bleaching action [1]. Many approaches are available for carrying out the bleaching of the teeth. In this regard, discoloration can be either extrinsic or intrinsic as discussed below;

¹Dental bleaching techniques; hydrogen-carbamide peroxides (2014).

²New Trends on In-office Tooth Bleaching (2016).

Extrinsic type

In this approach, the stains are associated with the accumulation of the chromatogenic substances on the surface of the enamel. Failure to observe personal hygiene, drinks, smoking and ingestion of chromatogenic-based food are some of the factors leading to extrinsic coloration [1]. The coloration are localized in the pellicle and result from the reaction between the sugars and amino acids as well as the retention of exogenous chromophores within the pellicle. The bleaching interventions in this type of stain involve the use of conventional prophylactic methods.

Intrinsic type

Intrinsic stains are as a result of deeper defects on the enamel. Aging, ingestion of chromatogenic food substances, smoking, cracks on the enamel as well as the excessive use of fluoride and thinning of the enamel are some of the contributing factors to this type of stains. Unlike extrinsic stains, intrinsic ones cannot be removed by the conventional strategies [5]. Bleaching agents that are capable of penetrating the enamel are often the best choices. The bleaching agent decolorizes the affected teeth by oxidizing the chromogen compounds. The stains arising from the aging process, use of tobacco or coffee show great response to conventional bleaching methods [6]. Tetracycline-induced stains display reduced response rates to bleaching. In the same vein, teeth with brown fluorescence have moderate response rate to bleaching.

Types of bleaching strategies

Different methods are available for bleaching vital and non-vital teeth. The assessment of the causes of the accumulation of stains is crucial in the implementation of the most appropriate bleaching technique.

Vital tooth bleaching

In-office, at-home and power bleaching are some of the options of attaining sparkling white teeth. For instance, in in-office bleaching, highly concentrated hydrogen peroxide (25 - 40%) is used as a bleaching agent. In some cases, the hydrogen peroxide is blended with the common OTC products. The soft tissues have to be protected by the use of rubber dam. Even though the in-office bleaching option is most effective, repeated procedures result in desired outcomes.

Nonetheless, at-home bleaching methods entail the use of lowly concentrated bleaching agents (hydrogen peroxide 3.5 - 6.5%, and 10 - 20% of carbamide peroxide). The individual patient carry out the procedures unassisted [7]. However, supervisory role of the qualified physician is highly recommended. The whitening gel is applied via a custom-fabricated mouth protection.

Most importantly, the OTC bleaching agents are increasingly becoming popular among most individuals who desire to have bright and sparkling teeth. The methods leverage on the use of very low concentration of the whitening substances [8]. The concentration of hydrogen peroxide (2 - 6%) is ideal for self-application in the home-based settings. Just like in other methods, the gum should be protected by shield or paints, and so forth. They are applied twice in a day for at least two weeks to attain best results.

Non-vital tooth bleaching

Many non-vital teeth whitening methods are currently available. For instance, non-vital powder, modified walking, and walking bleaching agents are some of the bleaching techniques [9]. The use of walking bleach method entails sealing a mixture with substances such as sodium perborate with water into the pulp of the affected teeth. The process is repeated severally to attain the desired outcomes. A combination of hydrogen peroxide (concentration of 30%) is crucial in augmenting the bleaching process. Other methods such as non-vital powder bleaching, the whitening gel (hydrogen peroxide, concentration of 30 - 35%) is placed on the pulp of the affected teeth. Light or heat is used to activate the bleaching process.

Advantages and disadvantages of dental bleaching

The occurrence of post-treatment hypersensitivity is a critical concern in the administration of dental bleaching treatment. The use of a high concentration of hydrogen peroxide contributes to the presence of such adverse events. The side reactions vary from one individual to another. It implies that no single treatment approach may be suitable across a population of patients. In other words, the dental office is not recommended for every individual. The physician should determine the appropriate concentration for every patient to prevent or minimize the potential side reactions [10]. The use of carbamide peroxide can be critical in attaining desired outcomes as far as dental bleaching is concerned. The interventional approach is essential for patients with a history of dentin hypersensitivity or individual susceptible to adverse reactions induced by the hydrogen peroxide [11]. Hydrogen peroxide concentration as high as 15% is still irritant to the pulp and can result in adverse events as far as dental bleaching treatment is concerned. Thus, in-office bleaching agents with low concentration can be crucial in addressing the challenge.

The use of hydrogen-carbamide peroxides is secure bleaching options. The treatment option is safe and helps in maintaining the health of the substrates. However, the set of skills and knowledge among the physicians are essential in the administration of the treatment process. The use of light activation is desirable, but it does not confer apparent advantages as far as acceleration and outcomes of the bleaching actions are concerned [12]. The use of hydrogen-carbamide peroxide is associated with reduced adverse events. According to Martin, *et al.* (2013), the bleaching strategy results in temporary and moderate side-effects, if any. Most importantly, such treatment option do not lead to any significant morphological changes on the enamel. Such advantages are realizable as long as the concentration of the bleaching agent is kept relatively low. In some cases, especially where the concentration of the bleaching agent is more than 35%, numerous side reactions occur. For instance, reduction in the hardness of the enamel as well as some histomorphological changes are some of the adverse events of the hydrogen-carbamide peroxide in high levels of concentration [13]. Increased sensitivity during the whitening processes is linked to the increased strength of the bleaching agent. The direct impact of time of exposure of the teeth under treatment and the concentration of bleaching agent as well as adverse effects on the pulp can provide insights on the administration of safe therapy.

Moreover, the use of high concentration of dental bleaching agents erodes the minerals and morphological structure of the enamel. The in-home bleaching method using 10% carbamide peroxide may imply an increased duration for desired bleaching action [8]. According to Epple, Meyer, and Enax (2019), increasing the concentration of the bleaching agent augments the bleaching action. However, such strategies may result in significant loss of minerals and its structure due to increased oxidation by the action of the hydrogen peroxide on the surface of the enamel [3]. Most researchers agree that the adverse effects of the bleaching gels vary significantly with some morphological changes on the enamel being insignificant while others are significant scale. In other words, the use of high levels of concentration of the bleaching gels results into considerable toxicity on the pulp cells, increased tooth sensitivity as well as erosion of the mineralized elements of the teeth [9]. Such outcomes are undesired and are pointers to the limitations associated with the use of some bleaching agents in in-office and home-based settings. The disadvantages of opting for dental bleaching outweigh the perceived aesthetic beauty of the outcomes.

The use of modern technology is critical in addressing shortcomings associated with the conventional methods of carrying out dental bleaching [14]. Mechanical and chemical bleaching strategies are been in use for quite sometimes. However, the recent advancements in the levels of technology has introduced the use of laser-based dental bleaching solutions. Plasma technology is a tissue-saving method that reduces the adverse impacts of administering conventional methods [9]. The method leverages the free moving charge carriers and has numerous medical and dental applications to address the weaknesses of the conventional approaches. Plasma technology can be used in both wet and dry settings and has a gamut of uses including preparation and disinfection of dental cavities, non-inflammatory modification of tissues as well as dental bleaching. Therefore, the technology has the potential of revolutionizing the field of dentistry.

Data synthesis

The assessment of the literature on dental bleaching options shows both the advantages and disadvantages of undergoing such treatments. For instance, in-office bleaching gel yields instantaneous as far as desired dental bleaching outcomes are concerned [9]. Bleaching agents such as carbamide peroxide and hydrogen peroxides give immediate effects on the whitening process [15]. The reduced safety concerns are due to the short duration of the treatment process, thus, preventing or minimizing complications such as high levels of sensitivity and morphological changes on the enamel.

Similarly, at-home bleaching options are relatively safe. The use of bleaching agents such as hydrogen peroxide with the concentration of more than 25% can lead to adverse reactions. Some of the common forms of side effects include the risk of tooth sensitivity as well as erosion of the enamel [9]. The at-home bleaching gels provide safer and effective strategies for enhancing the attainment of desired outcomes. Most researchers agree that in-office gels are highly concentrated and are the main contributors to the adverse events associated with bleaching actions.

The disadvantages of the bleaching agents, especially the in-office gels, include the deterioration of the morphological structure of the enamel. Most of the laser-based teeth bleaching options are the main contributors of teeth and gum sensitivity, mainly when using the derivatives of peroxides. In some studies, allergic reactions result [8]. However, the implementation of modern approaches is crucial in preventing or minimizing the side effects associated with the use of certain bleaching gels with high concentrations. For example, the use of dental dams is critical to the protection of the gums and teeth. Other approaches include the use of limited exposure time to the dental bleaching gels. Physicians administering the teeth bleaching treatments are currently taking precaution against soaking teeth in the enamel-weakening compound.

Nonetheless, it is important to note the dental bleaching treatments do not result in permanent outcomes. Regardless of the treatment options or bleaching agent used, teeth whiteness is not a continual process [9]. Maintaining dental hygiene, including shunning specific food substance, are some of the approaches to avoiding the recoloring of the teeth. In most cases, individuals undergoing such treatments are forced to have a circle of months to years to repeat the procedure to maintain sparkling white teeth.

Conclusion

Therefore, it is imperative to note that hydrogen and carbamide peroxides are some of the secure dental bleaching options. The knowledge and skills of the dentists are critical determinants of the attainment of desired treatment outcomes. Dental bleaching has both advantages and shortcomings. In this regard, weighing the potential risks and aesthetic beauty is crucial in the decision-making processes concerning the best treatment methods. Teeth sensitivity and changes on the morphological structure of the enamel are some of the disadvantages of opting for teeth bleaching services.

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