



ARTICLE REVIEW

Effect of dental desensitizers on odontalgia after tooth whitening: a review of the literature

Efecto de los desensibilizantes dentales en odontalgia post blanqueamiento dental: una revisión de la literatura

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ABSTRACT

Professional tooth whitening can cause sensitivity as a side effect due to the products and the process used. The objective of this research is to characterize the sensitivity secondary to bleaching and the effect of desensitizers to counteract it. A search for information was carried out in the SciELO, PubMed/MedLine and Scopus databases of the literature published between 2012-2021. The aggression suffered by tooth enamel and the exposure of dentin during tooth whitening seems to be the main cause of pain. However, this effect is temporary and diminishes over time. The use of desensitizers prior to treatment is recommended to reduce the likelihood of tooth sensitivity.

Keywords: Tooth Bleaching; Pain; Secondary Effect; Dentin Sensitivity.

RESUMEN

El blanqueamiento dental profesional puede ocasionar como efecto secundario sensibilidad debido a los productos y el proceso usado. El objetivo de esta investigación es caracterizar la sensibilidad secundaria a blanqueamiento y el efecto de los desensibilizantes para contrarrestarla. Se realizó una búsqueda de información en las bases de datos SciELO, PubMed/MedLine y Scopus de la literatura publicada entre 2012-2021. La agresión que sufre el esmalte de los dientes y la exposición de la dentina durante el blanqueamiento dental parece ser la principal causa para padecer dolor. Sin embargo, este efecto es temporal y disminuye con el paso del tiempo. Se recomienda el empleo de desensibilizantes previo al tratamiento pues disminuye las probabilidades de sensibilidad dental.

Palabras clave: Blanqueamiento de Dientes; Dolor; Efecto Secundario; Sensibilidad de la Dentina.

INTRODUCTION

Aesthetic or cosmetic dentistry has gained strength in recent years, resulting in high demand for many procedures. Tooth whitening is currently one of the most requested esthetic services in the field of dentistry.⁽¹⁾ This technique, perfected since the mid 60's, is minimally invasive. It applies conservation concepts, adding whitening type agents.⁽²⁾

Tooth whitening products have undergone a revolution in recent years, being produced for both in-office and home use. Despite this, the substances used in the whitening process still have side effects on soft and hard tissues, including hypersensitivity.⁽³⁾

About 45 million Americans suffer from sporadic tooth sensitivity and 10 million from chronic sensitivity. With respect to dental procedures, about 77 % of patients suffer from sensitivity during dental treatment therapies.⁽⁴⁾

In clinical practice, it is of fundamental importance that patients who are going to undergo the dental whitening technique undergo a correct anamnesis, especially in areas of dental sensitivity to stimuli provoked by the exit of air through the triple syringe, cold stimuli or tactile pressure. In this way an adequate therapy can be established, whose development is predictable for each patient's particular clinical condition.⁽⁵⁾

In the general population, about 14 % of patients abandon the treatment due to adverse effects, including tooth sensitivity. Therefore, when performing tooth whitening, the risks and side effects should be explained to the patient. As stated by Moradas et al.,⁽⁴⁾ one of the adverse effects associated with whitening is type III dental hypersensitivity, provided that the whitening is not carried out properly.

This may last four days after the procedure, an effect that has not been fully explained. However, it is suggested that it is a pulp response to the use of bleaching agents, there being an inflammatory reaction due to changes in the odontoblasts and dentin.⁽⁵⁾

In patients who present pathological loss of dental tissues or etiology other than dental caries, dental sensitivity is usually present. This should be taken into consideration when performing the anamnesis, since it can increase the adverse effects after tooth whitening.⁽⁵⁾

The literature proposes solutions for sensitivity that include pharmacological treatment, and analyzes its psychosocial impact. However, there are still claims that have not been given solid answers through scientific research. These include that bleaching is acidic, damages the enamel, splints are used, there are dietary and gestational restrictions, and there is a minimum age limit for its use, among others. It should be emphasized that in dentistry it is of utmost importance that every statement is based on solid scientific evidence, in order to provide an optimal service.⁽³⁾

The objective of this research is to describe the diagnosis, prognosis and protocols to control dental hypersensitivity.

DEVELOPMENT

It is considered that bleaching agents flow in the enamel and dentin towards the pulp chamber, even in short periods of time such as 15 minutes. These effects at the pulp level produce cellular and inflammatory changes similar to a reversible pulpitis. This diffusion subjects the pulp to oxidative stress, increasing its risk of producing damage at the pulp level; this is increased with the increase in temperature, varying according to the type of chemical activator used in the bleaching technique.

Chaple et al.,⁽⁵⁾ states that the most potent bleaching agent used in dental offices is 30-35 % hydrogen peroxide and can easily produce burns in soft tissues, such as irritation of the gastrointestinal mucosa (burning in the palate, throat and causing minor discomfort in the stomach or intestines, for example). This has been supported by other studies.⁽⁶⁾

Hydrogen peroxide and carbamide peroxide are unstable, and when exposed to dental tissue or a tooth surface tends to dissociate, transforming into smaller molecules which cause the tooth whitening effect. This causes the permanence of free radicals depending on the technique of the agent and the time of duration, causing oxidative stress. Oxidative stress in this case translates into the clinic as pain and sensitivity, also causing the loss of dental tissue and a decrease in its biomechanical properties.

According to Brannstron's theory, the stimuli that are provoked in the dentinal tubules cause an increase in the dynamics of the dental fluid that stimulates the nerve flexes on the odontoblasts generating stimuli that the nervous system interprets as pain.

Hydrogen peroxide has the ability to enter the target tubules and by its oxidation can partially penetrate the layers of the teeth. Hydrogen peroxide removes stains that discolor the tooth from the inside out, in contrast to toothpastes containing silica, which remove surface stains only on the outer layer of the tooth promoting a whitening to the enamel.⁽⁷⁾

Therapies to reduce sensitivity

There are several therapies to reduce sensitivity, either before or after treatment. These include calcium silicate, nerve repolarization, amorphous calcium phosphate, GLUMA and fluoride. There are also alternative therapies such as the use of anti-inflammatory agents, antioxidants and laser application.⁽²⁾

According to Farrais et al.,⁽⁸⁾ a good esthetic result can be obtained by combining bleaching with other treatments. However, when performing this type of procedure, patients are more sensitive. An example is the combined treatment of bleaching with microabrasion which, although it gives a favorable result, is more sensitive than a bleaching treatment based on carbamide peroxide and hydrogen peroxide.

In relation to this, the percentage of sensitivity varies according to the type of procedure and the place where it is performed. Luy Palacios,⁽⁹⁾ found that there will be a change in the pH level and tooth sensitivity after home tooth whitening, as well as that there is an inversely proportional relationship between salivary pH and time, as well as tooth sensitivity and time, after home tooth whitening treatment.

Complementing this idea, Radi et al.,⁽¹⁰⁾ state that dental whitening performed at home produces less sensitivity than that performed in the dental office, since in the dental office products with a higher concentration will be used. However, both are equally effective in obtaining a long-lasting color without changes for a certain period of time.

However, tooth whitening is not the only cause of tooth sensitivity. Rincones et al.,⁽¹¹⁾ report that rough brushing causes tooth sensitivity, generally associated with a lack of knowledge of proper brushing techniques. Likewise, he recommends the use of a toothpaste containing 8 % arginine to reduce tooth sensitivity.

Juárez Broom et al.,⁽⁶⁾ show that mixing sodium perborate with hydrogen peroxide between 3 % and 30 % is more effective than mixing it with liquid, minimizing root resorption. In contrast, Salazar et al.,⁽¹²⁾ stated that carbamide peroxide produces less sensitivity than hydrogen peroxide.

Araujo Pierote et al.,⁽¹³⁾ used plastic cuvettes after bleaching with different dentrifices where arginine, calcium carbonate and potassium nitrate showed reduced sensitivity.

Radi et al.,⁽¹⁰⁾ using the Everbrite™ home whitening kit also reported decreased sensitivity, as well as Rincones et al.,⁽¹¹⁾ when applying dentifrice with 8 % arginine.

It is said that after a tooth whitening treatment, sensitivity occurs between 55 % and 75 % of the cases; it is mild and transitory, lasting approximately 4 days, decreasing until it disappears completely in most cases.⁽¹⁴⁾

Orellana et al.,⁽¹⁵⁾ reports that among the adverse effects caused by the application of bleaching on vital teeth are dental sensitivity, damage to cellular components and alteration of blood flow. To mitigate this, Acosta de Camargo et al.,⁽³⁾ recommend the use of tooth whitening systems according to established parameters.

Recommendations

There are some general recommendations that can help to improve post-whitening tooth sensitivity, for example, the use of sugarless gum with recalcant. Oral hygiene should also be performed with soft filament brushes and non-abrasive potassium nitrate and stabilized stannous fluoride dentrifices; similarly, patients may be advised to reduce the consumption of acidic beverages.⁽¹⁶⁾

During tooth whitening, if there is low sensitivity, it is sufficient to use the whitening tray with sodium fluoride gel with neutral pH (Opal flower, Ultradent) for about half an hour daily. This is complemented with colorless 0,2 % (900 ppm) sodium fluoride stains several times a day.⁽¹⁷⁾

Patients who show a higher rate of tooth sensitivity due to bleaching may opt to reduce the bleaching agent concentrate, supplemented with a topical 5 % potassium nitrate mouthwash (Ultra EZ, Ultradent 10 % strontium chloride plus fluorides).⁽¹⁷⁾

In some cases, according to professional criteria, it is possible to opt for drug therapy with the use of pharmacological agents such as NSAIDs, for example, Ibuprofen 400 mg every eight hours.⁽¹⁸⁾ This is based on the fact that there are inflammatory processes caused by free radical agents from the peroxides of tooth whitening that travel through the dentin to the pulp, which cause an increase in neuropeptides such as substance P, causing vaso dilatation and accumulating inflammatory mediators. Especially when light or heat is used in the tooth whitening technique, rinses and fluoride pastes can be used once the treatment is finished, plus the use of the trays for half an hour daily with the placement of remineralizing agent such as ACP/CPP,^(19,20) Mi Paste Plus (GC Corporation).

More studies related to the subject are needed, since technology and new products are accelerating the process of minimizing dental sensitivities to allow this esthetic technique to be less and less limited by its collateral effects.

CONCLUSIONS

When performing a tooth whitening treatment, sensitivity may occur for various reasons, depending on the type of treatment and the concentration of the products used. The literature does not show a difference in the incidence of sensitivity produced by the use of hydrogen peroxide or carbamide peroxide. A moderate equality was reported between the treatments to reduce tooth sensitivity.

Conflict of interest

The authors declare that there is no conflict of interest.

Authors' contribution

All authors participated in the conceptualization, formal analysis, project management, writing - original draft, writing - revision, editing and approval of the final manuscript.

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