

Dental Whitening: Case Report

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Abstract

The increasing interest of aesthetic appearance in nowadays is due to its strong psychological impact on the subject itself. The multitude of solutions proposed to improve the patient's smile seems today to be a simple, effective and inexpensive alternative. It is important to focus on the value of these different techniques, evaluating their effectiveness, but also, their level of safety.

The aim of this work is to take stock of dental whitening techniques to implement the most appropriate therapy, through a clinical case, to achieve the natural and aesthetic appearance and thus satisfy the patient.

Keyword: Tooth Bleaching, Tooth whitening, Hydrogen Peroxide

Introduction

Whitening is a word increasingly expressed by our patients because of the current aesthetic that refers, among other things, to "white" teeth. All these elements will

allow us to give all the necessary explanations to our patients and the answers to their expectations, so that they are clarified on the possibilities of our treatments. Thus, it is imperative to warn the patient to the expectations from these techniques and show him their limits. Indeed, in combination with recent adhesive techniques, dental whitening represents a simple, stable and seductive solution to achieve very pleasant results (1). This non-invasive therapy consists of modifying a dark initial structure into a clearer and brighter final structure. Currently, we have at our disposal several techniques that allow the treatment of a large number of dyschromias, whether on vital or non-vital teeth. However, it is imperative to know the indications and the limits of these processes in the different situations encountered. This allows us to predict the outcome of these treatments, as well as their potential duration (2).

As a result, the protocols must be adapted to the clinical situation. Thus, it seems extremely important to understand the mechanism of action of the products available, because the side effects and the medico-legal aspect of this act should not to be neglected. Knowing the principle of action of the substances used will enable us to warn our patients of the possible risks posed by the various treatment options available. These treatments can be considered only in a comprehensive care including all the medical aspects of dental treatment (3).

Case Report



Figure 1 : 28-Year old female patient who consulted for an aesthetic prejudice regarding tooth #11

A 28-year-old female patient who consulted for a purely aesthetic purpose (Fig 1). She reports an aesthetic prejudice due to the grayish shade of the #11 and the yellowish appearance of the other anterior teeth. The medical history does not reveal any general pathology. However, she reports having a previous root canal treatment (RCT) on the #11.



Figure 2 : radiological examination of the #11

On clinical examination, we noticed signs of slight gingival inflammation. The 11 presents a sealed composite restoration, but the shade is not suitable. His radiological examination shows a dense canal filling, complete to the apex with an acceptable taper. The periapical area shows no signs of periapical pathology.

Therapeutic decision

For the sake of minimal intervention based on the concept of the therapeutic gradient, we suggested to the patient a non-invasive solution to reduce these unsightly stains. We explain to her that the treatment starts with an internal whitening of the #11 and followed by an external tray-based tooth whitening. The treatment will be followed by repairing the previous composite restoration, following the bonding and polishing protocol to ensure optimum sealing.

The patient was informed, before starting the treatment, of the limits and the risks of the treatment failure, or risks for the tooth itself. she has been warned that the results of these whitening techniques are not entirely predictable, and that it is likely that the original dyschromia will reappear over time. For this, it was explained to her that there must be a good motivation, because we cannot predict exactly how many times the whitening treatment will have to be renewed.

After setting up the operative field to protect the #11, an access cavity was realized. Special attention has been paid to the level of the pulp horns. All remains of restoration materials, root canal filling, necrotic tissue were removed. The healthy colored dentine was left in place at the risk of weakening the cavity. Then the canal entrance was cleared. At this stage, we checked the quality of the root filling, which showed no signs of infiltration. This step allow us to create the space where to put the protection

material to isolate the root and expose the dentinal tubules directed to the cervical region of the tooth. In addition, root canal filling was decreased with a Gates forest 1-3 mm apically. Isolation with a glass ionomer cement was made to prevent the penetration of the whitening component into the root.

First, the mixture of sodium perborate with distilled water is in proportions of 2 to 1. The consistency of the mixture must be creamy, or similar to wet sand. Then this mixture was inserted and stepped into the cavity with a mouth spatula. The excesses were removed and the edges of the cavity were cleaned with a cotton pellet. We left a space of 2mm for the temporary filling. It is an essential step in order to ensure maximum sealing and thus prevent any leakage of the product into the oral cavity. The more the material is hermetic, the better will be the prognosis of whitening. For this we used different materials like IRM® or glass ionomer cement according to their availability. It must have a minimum thickness of 2mm, and exert pressure on the whitening product. These steps were repeated several times, from a few weeks apart, until the desired shade was obtained.

Once the shade obtained is satisfactory, a calcium hydroxide was placed in the cavity before the final filling. This temporary filling was left in place for two weeks.

Parallel to this, a simple alginate impression was made, while paying particular attention to the registration of the collars for a good adaptation of the future trays. Then, the impression was cast in hard plaster and then cut so that it only has the dental arch to facilitate vacuum thermoforming.

Reservoirs on the buccal surfaces of the teeth to be lightened were made using a photopolymerizable resin. The principle is to make spacing on the model that will allow us to have tanks in the trays with a thickness

average of 0.5mm. This resin is affixed at a distance of about 1 mm from the marginal gingiva, proximal limits, the free edge or the occlusal surface of the teeth concerned.

The cutting of the tray is then performed following the contour of the necks of the teeth. This contour was smoothed in a second time to prevent the escape of the product during the wearing time and possible ingestion of the agent by the patient (**Fig 3**). The adaptation of the tray has been verified. Then a bleaching agent based on 16% carbamide peroxide was prescribed to the patient. The patient puts the tray itself at night for six hours. Its installation is done by vertical and horizontal digital pressures on the tanks.



Figure 3 : Trays confection



Figure 4: Results four weeks after the treatment.



Figure 5: Results three months after the treatment.

Discussion

The diagnostic approach is based on a good understanding of the etiologies of dyschromias. However, the term dental dyschromias covers a wide variety of tooth changes of various etiologies. Any alteration of the tissues constituting the tooth, whether mechanical, chemical or biological, causes a color change of the tooth (3,4).

These alterations can be generally due to extrinsic and / or intrinsic factors. Extrinsic dyschromias are superficial colorations, mainly due to staining of enamel surfaces by colored dental plaque, tartar, tobacco, some drugs such as chlorhexidine and other coloring substances encountered in everyday life, particularly in the diet : fruit, wine, soda, tea, coffee etc. Intrinsic factors are responsible for endogenous pigmentation and may be due to antibiotics, fluoride compounds, trauma, necrosis and pulpal bleeding, or incomplete canal filling. These are characteristic of the dyschromia of the pulped tooth. In this case, tooth staining occurs either by degeneration of the necrotic pulpal parenchyma or by pulpal bleeding which invades the dentinal tubules. Hemolysis then releases hemoglobin, which releases various products responsible for the color alteration of the tooth. We also very often encounter problems of secondary staining of the non-vital teeth, followed by a poor quality of restoration at the end of

endodontic treatment. In addition to the problem of bacterial percolation, the regular passage of chromogenic agents in the dentinal structure has the effect of coloring the dental organ more or less quickly (4).

In general, the dyschromias are related to the presence of organic compounds called chromophores located in enamel and dentin, and whose discoloration is possible by the destruction of one or more of their double bonds. The effectiveness of the whitening is therefore related to the oxidation of these chromophores. This process involves the use of hydrogen peroxide, which is the molecule of choice for these procedures. It seems that its effectiveness is based on its ability to generate free radicals that will diffuse through the hard tissues of the tooth. These free radicals are very powerful and extremely unstable oxidizing agents which, in order to stabilize, will tend to capture electrons from the double bonds of chromophores. This will cause a break in these bonds and therefore a change in the absorption of the light at these molecules. These reactions can take place depending on local conditions such as pH, temperature and the presence of UV or certain ions (5,6).

However, the use of hydrogen peroxide raises some questions about its possible side effects on the tissues and the body. According to Bistey et al., The morphological defects observed in enamel and dentin are proportional to the duration of the treatment and the used concentration (7). However, these induced effects are less than those observed following the use of orthophosphoric acid and can be counterbalanced by the potential of remineralization of the saliva (8,9).

It is also true that the studies that have been carried out in order to evaluate the adhesion forces following an internal whitening, have warned against imperfect bonding of the restorations at the origin of the increase of bacterial

micro-infiltrations (10). This decrease in bonding is essentially due to residual oxygen after whitening procedure. It causes a partial decrease in the polymerization of the resin and reduces its infiltration into the etched tissues (11,12). In fact, the oxygen reacts with the free radicals generated by the photoinitiator. The polymerization is stopped by affecting the hybridization and the sealing of the tooth / restoration interface. Nevertheless, adhesion values have been shown to return to normal between 24 hours to 3 weeks, depending on the studies . On the basis of these data, it is therefore recommended to leave a delay of at least 3 weeks between the completion of the whitening and the bonding of the composite resins (13,14).

In addition, hypersensitivities also represent a major side effect of whitening on vital teeth. The data on these sensitivities vary according to the studies, the product used and its concentration (15,16). According to Haywood et al. they concern 52% of the patients having brightened with 10% carbamide peroxide for 6 weeks (10). They are considered minor with outpatient treatment, while the most important are observed in-office whitening. The explanation of this phenomenon is not clearly understood. Some authors refer to the low molecular weight of hydrogen peroxide, which is able to diffuse through enamel and dentin and causes reversible pulpal inflammation, which causes transient dentinal hyperesthesia, and usually ceases a little after the cessation of the treatment . Indeed, the majority of the studies carried out report post-treatment sensitivities of a few days which can be attenuated with the application of desensitizing gels (15,16).

Side effects may also occur on the oral mucosa. According to a study published in ..., the use of 1% and 2% hydrogen peroxide on the tongue and oral mucosa of

the dog leads to edema and damage to the epithelium (17). Walsh emphasizes that the use of low-level products as part of a well-conducted treatment has no impact on the gingival mucosa. However, the same author remains cautious about the agents with high concentration, because, even if the damages are mostly reversible, the excesses are irritating and painful for the patient (18). Hence the interest of paying particular attention, especially to concentrations, whatever the technique used. As for the main consequences of whitening on non-vital teeth, these are represented by external cervical resorptions. According to the literature, these complications can reach 9.7% of cases (19). They can be explained by an irritative phenomenon related to the bleaching agent and the pH change or by an irritation of the periodontium colonized in a second time by the bacteria coming from the canal system itself. Other hypotheses stipulate that hydrogen peroxide has an effect on the differentiation of precursor cells of odontoclasts, thus leading to resorption (3). Therefore, it is necessary to isolate the active ingredient of the root canal filling with a waterproof dressing. The advantage of using glass ionomer cement is that once multiple whitening sessions are completed, the material can remain in place when the tooth is finally closed. It should be noticed that no material totally prevents the penetration of the bleaching agents into the root. They allow a clear reduction of their infiltration, and thus a better protection of the risk of appearance of external cervical resorptions of the treated tooth.

On the other hand, and to the extent that the studies, although much provided, do not agree on the precautionary measures to minimize the risk of external cervical resorptions, it is recommended to simply clean the cavity with 2.5% sodium hypochlorite and dry it with

air (3). Indeed, ATTIN et al., Do not advise to remove the dentinal sludge using EDTA, or to etch the walls of the cavity (20). CAVALLI et al. join this practice under penalty of leading to an increase in dentinal permeability, and consequently a diffusion of bleaching agents in the periodontium (21). However, DAHL and PALLESEN, as well as LOUIS and BONNET recommend cleaning with orthophosphoric acid for 10 or 15 seconds, followed by careful rinsing and drying to obtain an increase in dentinal permeability and thus a treatment efficiency brightening (22,23).

In addition, the question of the systemic toxicity of hydrogen peroxide arise naturally as it is an aggressive molecule. There are reports in the literature of severe and fatal cases of ingestion of hydrogen peroxide (3). On the other hand, this risk depends on the quantity of product ingested and therefore on the quantity related to the weight of the individual. When the ambulatory technique is recommended and in the first hours following the installation of the tray, a certain amount of hydrogen peroxide is released into the oral cavity and is therefore ingested. Toxicity tests in mice have shown that toxic effects start to be observed from 26 mg of hydrogen peroxide per kg of body weight per day (3). However, the extrapolation of these results to humans requires the use of a safety factor of 100 because we consider that man is 10 times more sensitive than the animal and that the difference in sensitivity between people vary by a factor of 10 (3). It is therefore appropriate in this type of treatment, to take all necessary precautions to avoid accidental ingestion under penalty of exposing the patient to adverse effects.

In addition, the carcinogenicity of bleaching agents remains controversial. Ingesting hydrogen peroxide at concentrations of 0.1% and 0.4% would have increased

the incidence of duodenal carcinomas in mice, and 1.5% would have increased the carcinogenic potential of a carcinogenic substance. in the duodenum and the jejunum of the rat (24). However, after reviewing the literature on this risk, Li concludes that agents used in ambulatory techniques are safe when used according to the manufacturer's prescription (25). Thus, in the absence of evidence on this risk, the International Agency for Research on Cancer has classified bleaching agents as not classifiable for carcinogenicity in humans (26).

Conclusion

The aesthetic demand has become a real concern in our society today. The growing interest in dental whitening therapies means that they find their place in the arsenal of aesthetic treatments. Currently, the development of these techniques and proposed products can make the practitioner hesitant in these therapeutic choices. These require scientific and technical knowledge of treatment modalities, control of side effects and precautions to take. However, the indications for an appropriate use of these methods are dependent on a correct diagnosis of the dyschromias. In the case of outpatient treatments using low concentration agents, side effects may be considered minor. Indeed, current studies are consistent in confirming that ambulatory techniques using weakly concentrated bleaching agents are reliable and without apparent risk.

The interest of the whitening techniques of the depilated teeth lies in their simplicity and their reproducibility. However, these techniques greatly increase the risk of developing external cervical resorptions. These pathologies are difficult to control and compromise the maintenance of the tooth on the arcade in the short or medium term. Thus, it requires us to pay great attention to the perfect mastery of the operative gesture. And although we know the principle of action of bleaching agents and

their effect on the teeth, however few studies focus on the mechanism itself. Hence the importance of informing the patients about the risks that can be incurred by these treatments.

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