

## Conservative esthetic treatment of a discoloured calcified permanent tooth: five-year clinical evaluation

Tratamento conservador estético de um dente permanente calcificado e escurecido: cinco anos de acompanhamento clínico

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### ABSTRACT

**Objective:** Pulp calcification can compromise tooth color and negatively affect esthetics. Definitive treatment for discolored anterior teeth with calcification is usually provided by endodontic treatment with the use of internal and external bleaching agents, as necessary. This article presents the conservative management of a vital tooth with an obliterated pulp chamber that led to changes in tooth color. The benefits and limitations of the use of in-office and home supervised bleaching techniques are discussed.

### KEYWORDS

Tooth bleaching; Dental pulp calcification.

### RESUMO

**Objetivo:** Uma calcificação pulpar pode comprometer a cor dos dentes e afetar negativamente a estética dental. O tratamento de escolha para um dente anterior escurecido e com calcificação pulpar é geralmente o tratamento endodôntico seguido de clareamento interno e externo, se necessário. Esse artigo relata um caso clínico de um tratamento conservador de um dente vital com câmara pulpar obliterada que ocasionou alteração de cor do elemento dental. Os benefícios e as limitações do uso das diferentes técnicas de clareamento dental utilizadas também foram discutidos.

### PALAVRAS-CHAVE

Clareamento dental; Calcificações da polpa dentária.

### INTRODUCTION

Usually, teeth with calcified pulp and color changes are treated by invasive techniques that do not maintain tooth vitality. Whereas, when no changes indicating the need for endodontic treatment are diagnosed in radiographic follow-up, the positive result of conservative treatment performed with in-office and home bleaching is a valid and interesting alternative.

Dentinal sclerosis, as a result of peritubular dentin deposition that gradually obliterates the pulp chamber and root canal, in esthetic terms, configures as an unfavorable clinical condition.

Pulp calcification will occur as a natural process of aging, but may also occur idiopathically or after direct pulp capping or trauma [1]. In a process termed “calcific metamorphosis”, early obliteration of the pulp can occur after significant traumatic injury to the affected tooth[2]. Typically, the tooth calcifies from the coronal portion down towards the apex and whether it is a problem or not, it really depends on how severe the calcification is.

In the worst cases, the entire inside of the tooth will calcify and the calcification may cause dental abscess. In these cases, endodontic treatment is indicated [3,4], however, if it

is not performed, changes in tooth color may compromise esthetics, and require clinical intervention.

Before the advent of vital tooth bleaching, esthetic treatment of vital discolored anterior teeth was only possible via invasive, irreversible restorative procedures such as porcelain veneers and crowns. Today, tooth bleaching represents a conservative alternative treatment for discolored teeth. After the introduction of the Nightguard vital bleaching technique, also known as dentist-supervised home bleaching: vital tooth bleaching became widely accepted by patients and dental professionals due to its simplicity, safety, effectiveness and low cost when compared with direct/indirect restorations.

## CASE REPORT

The patient, a healthy, 33-year-old Brazilian man, was referred to the Specialization Course in Restorative Dentistry of the Brazilian Association of Dentistry (Aracaju, SE, Brazil) complaining about the esthetic appearance of the maxillary right central incisor (tooth 11) (Figure 1).

The patient reported a history of childhood trauma, without painful symptoms. Clinical examination of tooth 11 revealed severe color changes, presence of cracks on the enamel surface and extrinsic stains on the lingual surface. Radiographic examination showed a radiopaque image in the pulp chamber region, suggestive of dystrophic calcification of the root canal with no signs of endodontic treatment and apical lesion (Figure 2). The tooth responded positively to sensitivity tests, namely thermal and electrical stimulation.

Taking into consideration the concepts of minimally invasive dentistry and with the aim of preserving tooth vitality, a decision was made to perform in-office external bleaching combined with supervised home bleaching [5]. The patient was informed about all the procedures that would be carried out, benefits and limitations of the selected treatment and importance of his

cooperation. In addition, he signed a term of commitment and responsibility before beginning the treatment.

In the first session, the initial color of the tooth was recorded using both digital photography and tooth color scale (Vita Classic, Vita, Zahnfabrik, Sackingen, Germany). An impression was taken of the maxillary arch, and an acetate tray was manufactured for the home bleaching.

After protecting the surrounding soft tissues with a gingival barrier (TopDam, FGM, Joinville, SC, Brazil), in-office bleaching was performed using a 35% hydrogen peroxide bleaching agent (Whiteness HP Maxx, FGM, Joinville, SC, Brazil) (Figure 3). The bleaching product was prepared according to the manufacturer's instructions. After two days of the in-office bleaching treatment, it was possible to verify the positive effects of the treatment on tooth color change and the patient was instructed to start the supervised home-bleaching, using a 20% carbamide peroxide agent (Opalescence, Ultradent Products Inc., South Jordan, UT, USA). The patient was instructed to apply the bleaching product in the tray for 4 hours a day, only in the region corresponding to the discolored central incisor (element 11) (Figure 3).

Two months after the first in-office bleaching, a second bleaching session was considered with 35% hydrogen peroxide. The product was applied as described for the first session; however, the application was done twice, for 15 minutes each time. Weekly professional monitoring was undertaken, the patient had no complaints and was highly motivated.

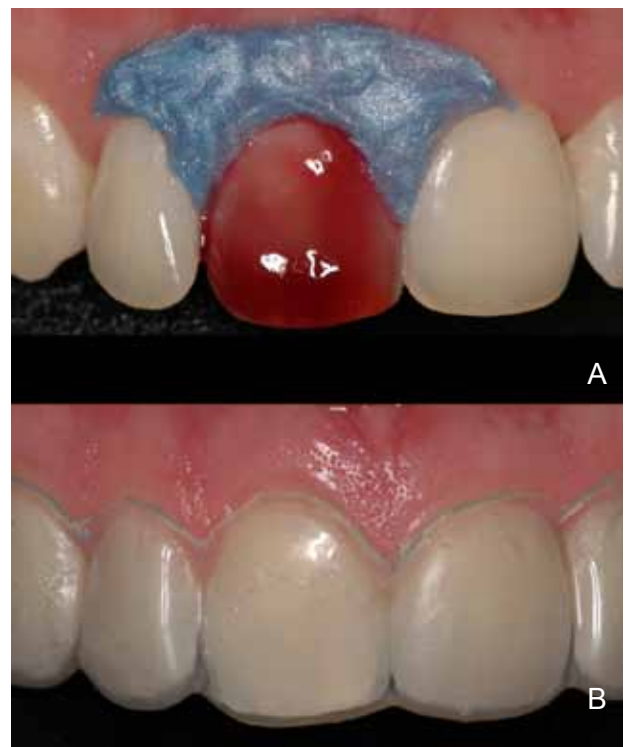
After three months of bleaching, the esthetic result was very positive and there was no need to perform further invasive restorative treatment (Figure 4). Five years after the conclusion of the treatment, the clinical (Figure 5) and radiographic (Figures 6) follow-up revealed that endodontic treatment or direct/indirect restorations were still not necessary.



**Figure 1** – Microstrain ( $\mu\epsilon$ ) results distribution according to base material and restorative technique (interquartile values).



**Figure 2** – Radiographic exam of the tooth 11, suggestive of dystrophic calcification of the pulp without periapical lesion.



**Figure 3** – (A) 35% hydrogen peroxide bleaching agent being applied on the tooth surface and (B) 20% carbamide peroxide applied only in the region corresponding to the tooth inside acetate tray.



**Figure 4** – (A) Buccal view of the tooth 11 after combined bleaching treatment and (B) patient's smile three months after conclusion of the bleaching treatment.



**Figure 5** – Patient's smile five years after conclusion of the bleaching treatment.



**Figure 5** – Radiographic exam of the tooth 11, after 5 years of follow-up.

## DISCUSSION

The most important factor in the dental bleaching process is an initial evaluation before bleaching treatment begins, which should include both the clinical and radiographic exam, with the intention of detecting and determining all the possible etiologies that caused darkening of the tooth [3].

When the dentist finds a darkened tooth, a periapical radiograph should be taken to evaluate the situation of the periapex and possible appearance of any alteration of resorption process [4]. In the clinical case described, the history of trauma in childhood was a very important information for the diagnosis and preparation of the treatment plan. The traumatized tooth did not develop into any symptomatic process, however, severe color alteration occurred, compromising the patient's esthetic appearance and self-esteem. According to Oginni e Adekoya-Sofowora (2009) [4], the majority of teeth that suffer some type of trauma, consequently present color alteration, which is generally characterized by yellowing of the tooth.

In cases of dental trauma, the tooth may take up to 20 years to demonstrate any radiographic evidence of apical pathology [3]. In view of this, the present article presents a report on the 5-year follow-up of the clinical case, with radiographic and pulp vitality control, with the purpose of detecting whether or not there was any painful symptomatology. Considering that at the initial time and in the follow-up consultations, no radiographic signs of pulp obliteration were found, and otherwise, there was no description of painful symptomatology, the affected tooth was not submitted to endodontic treatment [3] before the other procedures were performed.

In the event that there was any symptom, such as pain on vertical percussion, periapical inflammation and necrosis, endodontic treatment is indicated and performed in the same way as in any other tooth; however,

there are greater chances of perforations and complications [6]. To facilitate endodontic treatment of calcified root canals and pulp chambers, specific ultrasonic burs and tips have been created for these cases. In addition, dyes such as methylene blue associated with visualization under microscopes can be used [7].

McCabe and Dummer (2012) [6] affirmed that around 75% of the teeth with pulp calcification (obliteration by secondary dentin deposition) are symptom-free and need no treatment other than radiographic monitoring.

On the other hand, the esthetic approach to adopt is a relevant aspect that gains emphasis when the endodontic question is resolved, because tooth yellowing is the issue that causes a great discomfort for many patients. Traditionally, the therapy for cases of dystrophic calcification included the fabrication of direct or indirect veneers, or ceramic crowns. Other authors have suggested removal of part of the palatine dentine, by means of access similar to that performed in endodontics, to perform internal bleaching. Both approaches, however, are invasive and weaken the remainder of the teeth. Moreover, the use of bleaching agents in the pulp chamber increases the risk of external cervical resorption.

Recent reports have pointed out external bleaching as a possible esthetic solution in these cases. In addition to the potential capacity for resolving the case, this technique offers the advantage of not being very invasive, maintaining the dental structure, low cost, ease of the technique, more predictable results [8], being comfortable for the patient, and the possibility of invasive intervention, in the event that the desired success is not obtained. Nevertheless, a limitation of this technique is the progression of treatment in order to obtain the desired result, which may be slow [3] as a result of the lower permeability of the calcified dental structure to penetration of the bleaching agent, a factor that may be overcome by prolonging the treatment time.

A new bleaching treatment philosophy recommends the association of home bleaching with the in-office procedure [9]. This association has advantages, since the in-office technique - with a more stable and less caustic hydrogen peroxide - in association with the carbamide peroxide of the home technique - with potassium nitrate fluorides - helps to obtain dental bleaching with more rapid, predictable results and less risk of tooth sensitivity [9,10]. Although studies have shown that there is no difference in the bleaching effect when in-office bleaching is associated with home bleaching [11], the good results shown in the literature and the existent advantages [9] led to the authors' opting to use this combined technique.

In the clinical case presented, the choice of external bleaching with 35% hydrogen peroxide as the first option was chosen by the absence of alteration in shape and texture of the tooth compared with its contra-lateral analog, and the absence of restoration. The option for the combined technique (clinical bleaching + supervised home bleaching) was taken in view of the need to associate the positive aspect of the two techniques. The high concentration of the bleaching gel in the clinical modality allowed the visualization of very significant color changes in the tooth structure right from the first session. This was due to the greater release of free radicals that promote bleaching, which functioned as an aspect that motivated the patient to follow the proposed treatment. Moreover, these products have the characteristics of being easy and practical to apply, related to good viscosity and thixotropy, which allow good control of the procedure for application in the more darkened areas. In practice, one assumes that clinical bleaching "prepares" the tooth structure to receive the less concentrated supervised home bleaching gel, thereby reducing the response time in terms of visualizing the favorable chromatic change.

On the other hand, the advantages of the second bleaching modality proposed, using 20%

carbamide peroxide, leads to the need for a longer treatment time, to compensate the lower permeability of the dental structure to bleaching agent penetration. The use of products at low concentration for longer times allows minimization of the effects resulting from the rapid diffusion of free radicals, and above all, provides greater stability of the results achieved, since the chemistry of bleaching, and in a similar manner, the dental re-structuring are processed more gradually [12]

Studies have shown that in the oral cavity, this treatment does not change the properties of the tooth, like micro-hardness, morphology, roughness, and wear [1,6,11].

In the clinical case reported, after detailed anamnesis and radiographic diagnosis, the associated dental bleaching treatment (in-office and home) for the treatment of the darkened tooth with pulp obliteration was effective and met the expectations of both the patient and professionals. The patient was informed about the prognosis of treatment and the importance of periodic clinical and radiographic follow-up for a few more years, in order to control periapical health and maintenance of the bleaching procedure, due to the high incidence of recurrence [13].

## CONCLUSION

The in-office bleaching combined with home bleaching treatment promoted a most favorable esthetic result in the anterior tooth with pulp calcification and severe color alteration.

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Date submitted: 2013 Aug 29

Accept Submission: 2013 Sep 23