

An Alternative Treatment of Discolored Non-vital Endodontically Treated Teeth with Internal Resorption

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ABSTRACT

Internal bleaching technique is a common treatment option for discolored non-vital anterior teeth, but it is not advisable for cases with internal cervical resorption. Therefore, other conservative bleaching techniques, such as external bleaching, may be proper treatment options in this situation. Remaining discoloration should be covered by restorative options. The best choice for conservative restorations is ceramic laminate because of color stability, biocompatibility and durable esthetics. This clinical report presents the treatment of two severely discolored non-vital maxillary incisors with internal resorption in a 25-year-old man. A step-by-step practice is proposed for bleaching and restorative treatments of these discolored teeth are described.

Keywords: Ceramic laminate, Conservative restoration, Discolored Teeth, External bleaching, Tooth Bleaching.

INTRODUCTION

Nowadays esthetics is considered as essential as function.⁽¹⁾ Patients' esthetic expectations have expanded notably in the last decade. The appearance of dentition is of concern to many people seeking dental treatments and the color of teeth is of particular esthetic value.⁽²⁾ Importantly, the

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accurate diagnosis of the cause of discoloration is a condition with multifactorial etiology; it is classified as extrinsic and intrinsic and can occur due to a number of metabolic diseases, systemic conditions and local factors such as injuries. These factors affect the developing dentition and change the color of the teeth.⁽²⁻⁴⁾ Trauma to one or more permanent anterior teeth is the common cause of discoloration in young patients with trauma. Discoloration of teeth may be due to posttraumatic pulp hemorrhage and

intermittently physiologic retraction of the coronal and radicular extensions of pulp by apposition of secondary dentin.⁽⁵⁾ Maxillary permanent incisors are the most frequently injured teeth.^(6,7) The cause of slightly more frequent seeking of dental treatment after injury is due to esthetic than symptom.⁽⁸⁾ Two treatment options currently exist for discoloration: (i) ultraconservative chemical bleaching (office, home or walking belching techniques);⁽⁵⁾ (ii) complete coverage restoration (resin composite or porcelain). However, prevention of avoidable causes of tooth staining, which leads to tooth discoloration by practitioner and patient, should be considered.^(3,4) This case report demonstrates an adolescent male who suffered from considerable discoloration of both of his endodontically treated maxillary central incisors. The report shows the importance of an accurate evaluation of all the aspects of discolored teeth and an appropriate conservative treatment plan that cannot be achieved by restrictive treatment for non-vital teeth.

Technique

A 25-year-old man, in good general health, with discoloration of two of his maxillary central incisors was presented to the Postgraduate Operative Department of Tehran University of Medical Sciences. Discoloration was the chief complaint of the patient. Upon reviewing the dental history, it was noted that the same teeth had been traumatized 17 years previously. He had not received any treatment during this

period. Intraoral examination revealed normal gingival tissue, brownish discoloration of both centrals and chipping of the left central incisor (Figure 1a).



Figure 1a. Clinical view of central incisors with discoloration before treatment.

Upon radiographic evaluation, internal resorption was observed in both centrals, which might have been caused by trauma or inflammatory products. These teeth were filled with MTA (DENTSPLY, Tulsa Dental, and Tulsa, Oklahoma, USA) (Figure 1b).



Figure 1b. Periapical radiograph of central incisors. Note the internal resorption of incisors.

In the first appointment, the chief complaint of the patient was determined and pre-operative photographs were taken. Although several treatments for these situations can be used, chemical bleaching

was selected first as the patient demanded non-invasive esthetic procedures. Discoloration of root-filled teeth may be resolved by the time-saving internal bleaching method. Cervical root resorption has been reported as a side effect for this method. Thus, in this case the final consequence of internal bleaching was taken into account. Another conservative treatment option was external tooth bleaching; however, it was a time-consuming method. Additional restoration was necessary for the remaining discoloration after bleaching. Treatment options such as composite veneers, porcelain laminates and porcelain crowns were available. In this case, an atypical treatment choice is explained: first, external office bleaching was carried out (Figure 2),



Figure 2. Clinical view of central incisors after office bleaching technique.

followed by home bleaching. After bleaching an additional restorative treatment was critical for resolving the problem of the patient because the color mismatch of these two maxillary centrals was not removed completely. Here, the steps are explained.

Step 1. Office bleaching technique

First, all plaque and any extrinsic discoloration in both incisors were removed

by prophylaxis. The teeth were then isolated with cotton rolls and a high-speed evacuator. Provisional restorations were then removed by turbine high-speed handpiece. The pulp chambers were completely cleaned by a low-speed handpiece and small alcoholic cotton pellets. The pulp chambers were evaluated meticulously to ensure that no contamination or excessive material (provisional restoration) remained on them as they can have undesirable effects on the final result of tooth whitening. A piece of cotton was placed in the pulp chamber and then it was filled with resin-modified glass-ionomer as provisional restoration (GC International, Crop, and Tokyo, Japan). The buccal and palatal gingival tissue and lips were coated with Vaseline. Soft tissue was protected by a resin dam of Polo office material (SDI, Melbourne, and Austráli). Polo office tooth whitening material (SDI, Melbourne, and Austráli) was mixed according to the manufacturer's instructions. The mixture was applied on the external surface of both incisors for 20 minutes, and then both teeth were rinsed. During each appointment, this protocol was repeated three times with 5-minute intervals. Three appointments were programmed weekly for the patient with one-day rests between each of them. Treatment duration for external office bleaching technique was 3 weeks. After this treatment, the color mismatch was noticeably reduced but it persisted (Figure

2). Therefore, the bleaching technique was switched to home bleaching because it The first step was to take an alginate impression from the maxillary arch and a working model was casted in stone. Then a custom fitted tray was fabricated with a vacuum-formed splint as a mouthguard. The patient was instructed in how to floss the teeth thoroughly and how to do full-mouth prophylaxis. A complete explanation of how to use the bleaching material (based on instructions provided by the manufacturer) was written for the patient. In this case, 0.16% carbamide peroxide FGM home bleach material (FGM Dental Products, Joinville, SC, Brazil) was used. Treatment duration for home bleaching technique was 4 weeks. Patients undergoing nightguard beaching should be regularly reviewed and monitored (in this case every two weeks). Comparison of color mismatch at the end of 4 weeks showed it was very subtle (Figure 3).



Figure 3. Clinical view of central incisors after home bleaching technique.

In this situation, extremely long durations of application of the bleaching material did not have any benefits. Therefore, the

needed frequent visits to the dental office.

Step 2. Home bleaching technique

discoloration had to be covered by a restorative option.

Step 3. Additional restorative treatment

Generally in this patient, there were two problems. The first one was the existing color mismatch which confirmed the need for additional restorative treatment. These two discolored incisors were weakened by internal resorption and chipping. Therefore, the better choice should be less aggressive to preserve tooth structure. The second problem was the maintenance of bleaching treatment results. As a result, there was need for the restorative option to provide the possibility of carrying out bleaching again and making it more resistant to oral environmental stimulation (chemical, mechanical, thermal). Based on these explanations, feldspathic ceramic laminates were chosen. A delay of 2 weeks after the final whitening appointment allowed dissipation of excess oxygen from the tooth structure; temporary restorative materials (RMGI) were replaced with the composite restorations. Lighter shades of resin composite were recommended to compensate the bleaching procedure that was not completely successful.⁽⁸⁾ Lighter Vitalessence composite resin (Ultradent Products Inc., South Jordan, UT, USA) was selected and its color was modified by adding tint (Kerr Corporation, Orange, CA, USA). Before any tooth preparation, the patient was referred to the laboratory for

shade selection. Tooth preparation was performed with a round-end shoulder bur to a depth of 0.3–0.7 mm with round smooth contours, without any incisal reduction and a short reduction of about 2 mm (height) and 0.5 (depth) was carried out on the palatal aspect. Depth of discoloration in some regions of these incisors was greater. Therefore, for masking them, structural tooth reduction was increased a little (0.7). These two laminates were cemented with Opalis flowable composite resin (FGM Dental Products, Joinville, SC, Brazil). The internal surfaces were conditioned by 9.5% HF (FGM Dental Products, Joinville, SC, Brazil) and silane (FGM Dental Products, Joinville, SC, Brazil) and silane (FGM Dental Products, Joinville, SC, Brazil). Tooth conditioning was carried out by 37% phosphoric acid gel (Scotchbond; 3M ESPE Dental Products, St Paul, MN) and Scotch Bond multipurpose bonding (Scotchbond; 3M ESPE Dental Products, St Paul, MN) before cementation. Final clinical view after and before treatment are shown in Figure 4.



Figure 4a. Clinical view of central incisors before treatment.



Figure 4b. Clinical view immediately after veneer cementation.

Recalls of the patient after 6 and 12 months following cementation of laminates are shown in Figure 5.



Figure 5a. Photographic picture at 6-month follow-up.



Figure 5b. Photographic picture at 12-month follow-up.

DISCUSSION

With a wide-ranging shift toward an increased attention to esthetic dentistry, clinicians must be aware of techniques of preventing or resolving tooth discoloration. The treatment for tooth discoloration can include several options such as conservative chemical bleaching and complete-coverage restorations.^(3,5) A grasp of the pathologic processes involved in tooth discoloration can assist in achieving the ultimate final outcome. Trauma is one of the causes of discoloration. Disruption of vascularity occurs after suffering from significant trauma.⁽⁹⁾ Healing of the pulp is different from other tissues because it is surrounded

by dentin and is isolated from inflammatory response. Pulp degradation after trauma may cause hemolysis of red blood cells. The iron in the hemoglobin reacts with hydrogen sulfides, a bacterial byproduct, to form a strong pigment (iron sulfide) that may permeate into the dentin of traumatized teeth.^(5, 9) If revascularization occurs and the pulp survives, the tooth can relapse to its normal color. In any situation that the pulp does not survive following trauma, hemolytic byproducts remain in it, resulting in discoloration.⁽⁹⁾ In this case, the pulps of these two centrals were necrotic. We do not have any clear history about tooth injury. Two explanations exist about the pulp necrosis mechanism. First, pulp vitality of these two incisors might have been influenced by invasion of bacteria and toxin infiltration inward, exposing the dentinal tubules in the area of enamel-dentin fracture. Risk of pulp necrosis in untreated crown-fractured teeth with extensive dentin exposure is increased. Therefore, early coverage of opened dentinal tubules is important. The second mechanism is undiagnosed luxation injuries.⁽¹⁰⁾ Internal resorption is shown in Figure 1b. Internal resorption is recognized after the necrosis of odontoblastic cells. It may be related to pulp partial necrosis or chronic pulp inflammation. When it is recognized it should be treated as soon as possible. MTA is a preferable choice in internal resorption case for filling the root canals because of proper mechanical and

physical properties.⁽¹¹⁾ Filling of root canals in this case was carried out with MTA (Figure 1b). The most effective method of managing discolored, non-vital anterior teeth is bleaching.⁽⁹⁾ Several bleaching techniques exist. "Walking bleaching" technique can be used for whitening of endodontically treated teeth, which is a simple time-saving and easy process with greater cosmetic outcomes.⁽¹²⁾ Increased risk of tooth fracture and cervical resorption are the side effects of this technique.^(8,13) Cervical or internal resorption is an alarm in non-vital teeth that have had trauma.⁽¹⁴⁾ Trauma and walking bleaching method have additional risks for cervical resorption. As a result, walking bleaching method was not appropriate for this patient. Teeth that are root-filled are also amenable to the nightguard bleaching method as the first option of management of discoloration. In-office bleaching procedures appear to be suitable substitutes for home bleaching applications, mainly in patients with very severe discolorations, discoloration of single teeth, lack of patient compliance or if a fast treatment is preferred. It could be practical as a variety of boost therapy; that way the bleaching practice might be carried out afterwards by home-bleaching procedures.⁽¹⁵⁾ In-office bleaching method requires several visits to the dental office; therefore, this method is switched to home bleaching.⁽⁵⁾ In this case after chemical bleaching (in-office bleaching and home bleaching), mismatch of color was

considerable. Thus, other restorative options were necessary. There are particular conditions that must be considered when choosing the appropriate treatment option for esthetic restorations, such as open communication with the patient to talk about his or her expectations, followed by precise clinical execution by the provider.⁽¹⁶⁾ This patient emphasized that the restorations be more durable with minimal reduction of tooth structure.

Treatment options such as veneers and porcelain crowns were available.⁽¹⁷⁾ Porcelain crown for restoration of discolored anterior tooth was an invasive procedure relating to reduction of tooth structure and was not cost-effective.⁽¹⁸⁾ Veneering is a more conservative approach that preserves a natural tooth structure. Indirectly fabricated veneer is more durable and less technique-sensitive than directly fabricated veneer.⁽¹⁷⁾ The best choice for

SUMMARY

External bleaching technique and porcelain laminate were employed for internalized discoloration of weak non-vital teeth, with an acceptable follow-up of 12 months. These treatment options are conservative approaches.

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conservative restorations is ceramic laminate because of color stability, biocompatibility and durable esthetics.⁽¹⁹⁾ Different types of ceramics are available. Feldspathic ceramic provides uniform translucency and shade⁽²⁰⁾ and higher shear bond strength to enamel.⁽²¹⁾ DEJ was a key element for properties of porcelain laminate; therefore, an attempt was made to conserve it in preparations for veneers. Various kinds of cements were available. The selected cement was flowable composite because of simplicity in manipulation and comparable shear bond strength with dual-polymerized and light-polymerized resin cement.^(21,22) It can be concluded from this case report that it is occasionally better to carry out conservative bleaching technique for non-vital traumatized teeth with internal resorption to maintain sound structure of teeth so that conservative restoration can be practical.

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