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Aesthetic enhancement of discolored non-vital teeth – A conservative approach

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ABSTRACT

Anterior teeth are an integral part of facial aesthetics as they are involved in complex social and cultural interactions and have a high social impact. Discoloration of non-vital teeth is intrinsic in nature and can be of various aetiologies. A conservative treatment modality for managing such cases is through non-vital bleaching technique. Many methods to bleach non-vital teeth have been suggested. The most recommended procedure is the walking bleach technique. This technique is known to be simple, safer, and more agreeable to both the patients as well as dentists. The case reports in the present article aim to demonstrate the successful aesthetic rehabilitation of discolored non-vital maxillary anterior teeth using walking bleach technique

.Keywords: *Aesthetics, Non-vital bleaching, Conservative technique, Walking bleach technique*

1. INTRODUCTION

Aesthetics is a field of growing importance, especially because having an aesthetic smile has a psychosocial impact that influences the individual's self-perception. [1] Discoloration of teeth, particularly in the anterior region, can lead to significant impairment in the cosmetic appearance of an individual.

Discoloration of a non-vital tooth is an externalization of the diseased state of the pulp-dentin complex which is visible through the enamel due to its inherent translucent nature. The visual impact of discolored teeth is considerably greater when a chromatic change occurs in a single tooth, as the color discrepancy with the remaining teeth becomes more evident. [1]

Non-vital tooth discoloration may have many causes, namely dental trauma, presence of necrotic debris on the pulp horns and dentinal tubules [1], calcific metamorphosis, poor irrigation, or sealing materials located in the pulp chamber or chamber walls. [1] Necrosis of the tooth pulp results in the release of disintegration by-products and these may infiltrate tubules, thereby discoloring the surrounding dentin. Acute trauma to a tooth can cause intra-pulpal hemorrhage, thereby giving it a reddish tinge which can later change to grey-brown as time passes due to pulpal necrosis. The hemolysis of the red blood cells causes the release haem. The released haem, in turn, combines with the necrosing pulpal tissue to form iron sulphide, which is black in color.

Non-vital teeth that are extensively discolored are highly receptive for bleaching techniques. [2] Internal tooth bleaching is a minimally invasive, conservative, relatively simple, effective, and low-cost method in the treatment of discolored endodontically treated teeth. [1] Various methods to bleach non-vital discolored teeth have been proposed, the most common being the walking-bleach technique. It is the most recommended method as it is simple, safe, with lower risks and suitable for patients and dentists.

The following case reports aim to illustrate the successful aesthetic enhancement of discolored non-vital anterior teeth using the walking bleach technique.

2. CASE REPORTS

2.1 Case 1-

A 25-year-old female patient reported to the Department of Conservative Dentistry and Endodontics, Government Dental College and Hospital Aurangabad, complaining of pain, pus discharge and discolouration with her maxillary right central incisor, i.e. 11 (Figure 1). The patient gave a history of trauma 4 years ago in the same region.

On clinical examination, Ellis class IV fracture with yellowish-brown discoloration of the crown was observed with 11. A sinus tract opening was also observed in the same region, which was traced with a size 25 guttapercha point using a radio-visiograph. The tooth was also tender on vertical percussion. Intraoral periapical radiograph revealed periapical rarefaction with 11 (Figure 2). The tooth also gave a negative response to the electric pulp sensitivity test as compared to the adjacent and contralateral teeth.

Figure-1 Pre-operative photograph

Figure-2 Pre-operative radiograph

Based on these findings, a provisional diagnosis of acute exacerbation of chronic periapical lesion with 11 was established. After discussing the treatment options with the patient, a conservative approach of root canal treatment followed by non-vital bleaching and composite resin restoration of 11 was opted.

Access opening and complete biomechanical preparation of 11 was done under rubber dam isolation (Figure 3 and 4).

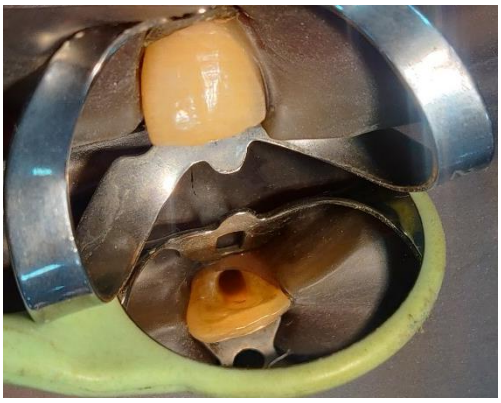

Figure-3 Access opening with 11

Figure-4 Working length determination

Calcium hydroxide was placed as an intracanal medicament(Figure 5) and the patient was recalled every week for follow-up assessment of symptoms. After 3 weeks, healing of the sinus tract was observed, and the patient was asymptomatic (Figure 6). Obturation of 11 with lateral condensation of gutta-percha was done, the access cavity was sealed using Cavit G (3M ESPE) temporary restorative material and the patient was recalled after a week for the bleaching procedure (Figure 7).

Figure-5 Intracanal medicament placed

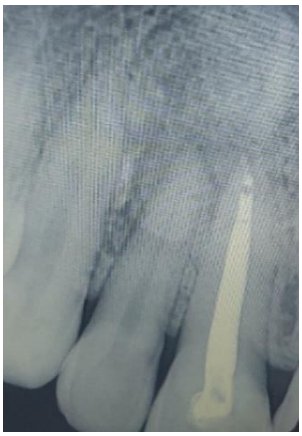

Figure-6 Follow-up after 3 weeks

Figure-7 Post-obturation radiograph

After isolation of the tooth using rubber dam, the temporary restoration was removed, and the endodontic access cavity was modified to ensure that no filling remnants were present in the pulp chamber and pulp horns. The gutta-percha filling was removed from the

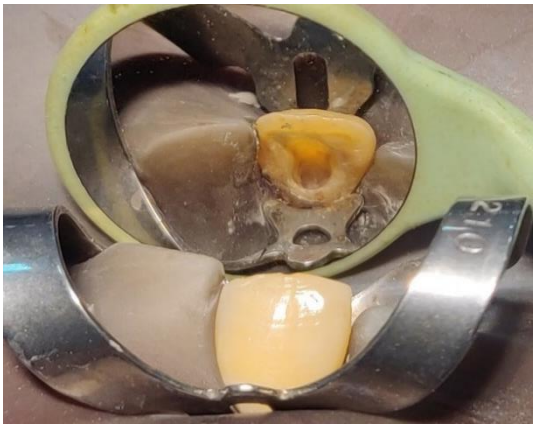

Figure-8 2mm guttapercha removed

access cavity to 2mm apical to the cemento-enamel junction using gates-glidden drills (Figure 8). A 2 mm plug of glass ionomer restorative cement was then placed over the gutta-percha in the cervical region to prevent percolation of bleaching agent to the surrounding periodontal tissues (Figure 9a and 9b).

In a dappen dish sodium perborate powder was mixed with distilled water to obtain a thick paste which was then placed inside the access cavity of 11 (Figure 10). Cotton pellets were used to blot off the excess liquid from the paste. A temporary restoration was packed on top of the paste using glass ionomer restorative cement to ensure a good seal (Figure 11) and the rubber dam isolation was removed.

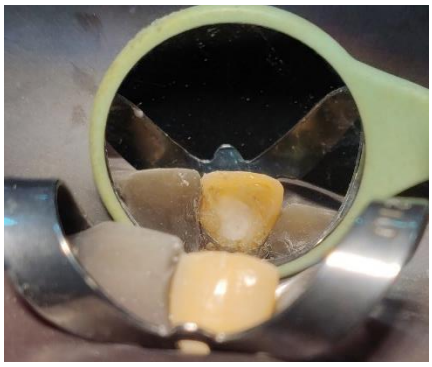

Figure-10 Sodium perborate paste placed inside access cavity

Figure-9a & 9b 2mm Glass ionomer cement placed

Figure-11 Temporary restoration using glass ionomer restorative cement

The patient was recalled after every 7 days for assessment of the bleaching results. Weekly replacement of the bleaching agent with a fresh paste of sodium perborate was also done by repeating the same procedure. After 3 weeks, the anticipated bleaching results were achieved with an improved cosmetic appearance (Figure 12a, 12b and 12c).

Figure-12a Bleaching result after 1 week

Figure-12b Bleaching result after 2 weeks

Figure-12c Bleaching result after 3 weeks

After the completion of bleaching treatment, the pulp chamber was cleaned, dried. The cavity was closed with Cavit G (3M ESPE) temporary restorative material and the patient was called after 2 weeks for permanent restoration and build-up of the fractured tooth structure with composite resin (Figure 13).

Figure-13 Post-operative photograph

2.2 Case 2-

A 23 year old male patient was referred to the Department of Conservative Dentistry and Endodontics, Government Dental College and Hospital Aurangabad, because of pain and discolouration with his maxillary left central incisor, i.e. 21 (Figure 14). He gave a history of trauma in the same region 6 years ago. The patient also reported that he had undergone root canal treatment with the same tooth 3 months ago.

Figure-14 Pre-operative photograph

Clinical examination revealed dark yellowish discoloration and tenderness on vertical percussion with 21. Intraoral periapical radiograph revealed incomplete obturation of the root canal of 21, with the obturating material extending only till the middle one-third of the canal. Calcification of remaining unobturated canal was also noted. Periapical rarefaction of the same tooth was observed in the radiograph.

Based on these findings, a provisional diagnosis of calcific metamorphosis and failed endodontic treatment with 21 was established. After discussing the treatment options with the patient, repetition of the root canal treatment followed by non-vital bleaching of the concerned tooth was decided.

The endodontic retreatment procedure was done with 21 under rubber dam isolation using calcium hydroxide as the inter-appointment root canal medicament. After obturation of the root canal and confirmation of satisfactory apical seal using radiograph, the patient was recalled for bleaching after 1 week.

The same procedure was repeated for 21 under rubber dam isolation, using a paste of sodium perborate by mixing with distilled water for achieving the bleaching results. The patient was recalled at weekly intervals for three weeks, during which the sodium perborate mixture was refreshed. After 3 weeks, satisfactory aesthetic result was achieved (Figure 15), following which the pulp chamber was cleaned, dried and the cavity was closed with Cavit G (3M ESPE) temporary restorative material. The patient was recalled after 2 weeks for the final permanent restoration with composite resin.

Figure-15 Post-operative photograph

3. DISCUSSION

Discolored anterior teeth should be considered as a significant aesthetic impairment which can compromise patient's physical, psychological and social well-being. Non-vital bleaching is the minimally invasive procedure for esthetic rehabilitation of discolored non-vital teeth. [2] First described by Spasser in 1961, the walking bleach technique can be described as enclosing a mixture of sodium perborate and water within the pulp chamber of the discolored non-vital tooth. [3]

Sodium perborate is stable when in the form of a dry powder but, in the presence of acid, warm air or water, it decomposes to form metaborate, hydrogen peroxide and nascent oxygen. [4] The complex carbonic chains of the pigment are transformed into CO2 and H2O, being gradually released together with the nascent oxygen [5], resulting in smaller molecules with free hydroxyls (which reflect the blue light along with the green and red spectra), thus giving the whitening effect.

There are risks associated with non-vital teeth bleaching, the most serious of which is external cervical root resorption. Presumably, the diffusion of hydrogen peroxide through the dentinal tubules and micro-perforations of the intra-orifice barrier cement to the cervical periodontal ligaments is responsible for the destruction of the hard tissues at the level of the cementoenamel junction. [1] It has been established that 30% hydrogen peroxide alone or in combination with sodium perborate are more cytotoxic for periodontal cells than perborate-water mixture. [2] Heat application causes widening of dentinal tubules, facilitating easier diffusion of hydrogen peroxide to the periodontium. [6] Hence, the use of hydrogen peroxide was substituted with warm distilled water and heat activation of the mixture was avoided.

The prevention of the percolation of bleaching agents into the surrounding peri-radicular tissues is impertinent. This is achieved by ensuring that a proper cervical barrier is placed at the level of the cemento-enamel junction and a good seal is achieved. In this case glass ionomer cement was used as the barrier material. The shape of the barrier was kept as 'bobsled tunnel' facially. [7] The cervical barrier of such shape blocks all the dentinal tubules which run from pulp chamber to external tooth surface apical to the level of epithelial attachment, thereby securing the bleaching agent within the pulp chamber cavity, which in turn prevents the incidence of external root resorption occurring as a side effect of the treatment procedure. [7]

4. CONCLUSION

Internal bleaching is a conservative, simple, effective, and low-cost treatment plan, with good esthetic results, for the management of non-vital tooth discolorations. Walking bleach technique is the most common method used for this purpose. In order to prevent seepage of hydrogen peroxide through dentine, it is necessary to place a dense root filling and an additional cervical seal prior to starting the walking bleach procedure. [8] Proper treatment protocol must be followed, and adequate precautions should be employed to avoid risks associated with this procedure.

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