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Endodontic and esthetic rehabilitation of a discoloured non-vital young permanent tooth- A case report

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ABSTRACT

The purpose of this case report is to present the treatment of immature necrotic discolored permanent incisor with the use of apical plugs of mineral trioxide aggregate (MTA) for apexification and walking bleach technique to remove discoloration. With this technique, MTA mixture is used to create an artificial stop against which to condense gutta-percha in pulpless teeth with open apices. The report of this case confirms that MTA acts as an apical barrier and can be considered as an effective material to support regeneration of apical tissue in immature necrotic teeth. The present article reports the successful bleaching of discolored non-vital, endodontically treated tooth with good prognosis.

Keywords: MTA, Apexification, Non-vital tooth bleaching

1. INTRODUCTION

Traumatic anterior teeth are very common during childhood and adolescence and often results in loss of vitality and tooth discoloration posing a great challenge to a clinician treating young pediatric patients. In general, these injuries take place before root formation is complete and may result in the inflammation or necrosis of the pulp tissue [1]. Loss of vital pulp in immature permanent teeth may result in cessation of root development and compromised apical closure [2]. Consequently, the root canal remains large with thin and fragile walls and the apex remains open. As root canal filling techniques require an apical constriction against which an obturating material can be placed, it is essential to create an artificial barrier or induce closure of apical foramen with calcified tissue [2, 3].

Calcium hydroxide has been used successfully to effect an apical barrier formation i.e. apexification in these teeth [4, 5]. However, the length of time required for this is variable, ranging from 3-18 months [6]. This presents problems with patient compliance, re-infection due to loss of temporary restoration and also predisposes the tooth to fracture [7-9].

A one-step apexification procedure eliminates these problems. It implies the non-surgical compaction of a biocompatible material into the apical end of the root canal, thus, creating an apical stop and enabling immediate filling of the root canal [10]. MTA has been described as a good material for this procedure owing to its good canal sealing property, biocompatibility, and ability to promote dental pulp and periradicular tissue regeneration [10-14].

Discoloration of teeth, especially the interiors, following trauma can result in considerable cosmetic impairment in young children. Patient demand for aesthetic procedures and the trend for non-invasive dental treatment have led to the development of different materials and whitening techniques that are capable of re-establishing a patient's smile without affecting dental structure [15]. Besides invasive and expensive conventional restorative options, such as full crowns or veneers, whitening of teeth is an alternative therapeutic method [16]. Internal bleaching procedures such as the "walking bleach" technique with sodium perborate and distilled water stand out because of its superior esthetic results with no side effects.

This case report describes the endodontic and esthetic management of a discolored non-vital young permanent central incisor using MTA and walking bleach technique, respectively.

2. CASE REPORT

A 9-year-old male patient reported to the Department of Pedodontics and Preventive Dentistry, Sri Rajiv Gandhi College of Dental Sciences, with a complaint of broken and mobile upper front tooth. There was a history of trauma to the same tooth 2 days back. Medical history revealed a healthy child, with up to date immunizations, no known drug allergies and a tetanus booster given when he was 6 years old (Fig 1).

Intraoral examination revealed a laterally luxated maxillary right central incisor [11] associated with enamel-dentin fracture. Radiographic examination revealed an immature tooth with a wide-open apex, not associated with any periapical changes. The tooth was digitally repositioned and splinted with a braided ligature wire using acid-etch composite technique. The child was instructed postoperatively to eat a soft diet, brush teeth with a soft toothbrush after each meal, and use chlorhexidine mouth rinse (0.12%) twice daily for 1 week (Fig 2). The patient was recalled after 2 weeks. On the recall visit after 2 weeks, a grayish discoloration of the tooth associated with pain suggestive of pulp necrosis was noted (Fig 3). A one-step apexification preceded by canal disinfection for two weeks with calcium hydroxide was planned for this tooth. Following administration of local anesthesia, rubber dam application was done and access cavity was prepared. The working length was determined and the canal was instrumented and irrigated with 2.5% NaOCl, and dried with paper points. Calcium hydroxide was placed in the canal and a temporary coronal seal was established with Cavit GTM. As there was a reduction in the mobility of the tooth, splint removal was done in the same appointment.

The patient was recalled after 2-weeks and canals were irrigated using 2.5% NaOCl, and dried with paper points. A mixture of ProRoot MTATM powder (Dentsply) and distilled water was compacted to a thickness of 4mm in the apical portion of the root canal with pluggers. A wet cotton pellet was placed in contact with the MTA and the cavity was sealed temporarily with Cavit G to facilitate setting. After 72 hours the temporary filling and cotton pellet was removed and the hardening of MTA was confirmed using gutta-percha points. The remaining portion of the canal was obturated with gutta-percha and the cavity was sealed with glass ionomer cement. A postoperative radiograph demonstrated a satisfactory obturation (Fig 4).

The patient was recalled after 15 days, to find the tooth asymptomatic with no pathological feature. Preoperative shade matching was done with VITA classical shade guide (VITATM Zahnfabrik, H.Rauter GmbH, and co., Germany) as C4. After the application of protective cream on the surrounding gingival tissue, the tooth was isolated with rubber dam and the access was re-established. Coronal gutta-percha was removed from canals about 2 mm apical to the cervical line. The cavity was irrigated with NaOCl to remove smear layer and debris. A plug of 2 mm thickness of a glass ionomer was placed on top of the gutta-percha filling in a shape conforming to the shape of outer CEJ and 1mm incisal to it by external probing of the CEJ and epithelial attachment to prevent percolation of bleaching agent into the cervical and apical region.

A mixture of sodium perborate and distilled water was placed inside the pulp chamber and sealed with Glass ionomer cement. The patient was recalled once in a week to evaluate the changes. After 3 visits there was a marked change in the tooth color with satisfactory results, following which the sodium perborate was flushed out from the pulp chamber and the tooth was restored with composite resin. (Fig 5)

3. DISCUSSION

This report describes a case where apexification and orthograde root canal treatment were done prior to intracoronary bleaching for treatment of a non-vital discolored immature maxillary right central incisor. A tooth with an immature open apex presents the problems of overfilling and poor apical seal of obturation. An apical barrier is much desired to enable optimal obturation of the root canal system [17]. Calcium hydroxide has been used with great success to effect an apical hard tissue barrier in immature open apices. The main problem with traditional apexification using calcium hydroxide is the long treatment period, which may extend up to 21 months [18]. The treatment results are affected by many factors, such as the diameters of open apices, the degree of tooth displacement by trauma, and the method used for tooth repositioning. Also, during a long apexification treatment, there is a possibility of root canal reinfection due to marginal leakage of temporary restorative material.

A variety of artificial apical barrier materials have been suggested as an alternative to traditional calcium hydroxide apexification [19-21]. However, among these, MTA is shown to be the most promising and most popular biomaterial owing to its several advantages comprising of single visit placement [22], biocompatibility [23], excellent sealing properties [24] and low solubility [25]. The ability to set in presence of blood has favored placement of MTA apical barrier adjacent to periapical tissue [26].

In the present case, the difficulty in obtaining an apical stop to enable controlled obturation was overcome by placement of mineral trioxide aggregate (MTA) after interim treatment with calcium hydroxide for 2 weeks. The rationale is to limit bacterial infection in the teeth because both endodontic instrumentation and disinfection are made difficult by the unusual endodontic architecture.

The present clinical case confirms that MTA acts as an apical barrier and can be considered to be a very effective material to obtain an apical seal in immature teeth with open apices. The other challenge posed by traumatic injuries to young permanent teeth, apart from the loss of vitality, is tooth discoloration. Internal bleaching procedure such as the "walking bleach" technique can be used for whitening of discolored root-filled teeth, as it is a simple and time-saving method with superior esthetic results and safety. The first description of the walking bleach technique with a mixture of sodium perborate and distilled water was mentioned in a congress report by Marsh and published by Salvias [27]. This technique is performed by application of a paste consisting of sodium perborate and distilled water or 3% hydrogen peroxide (H₂O₂) respectively, in the pulp chamber [28]. This mixture releases H₂O₂, which is able to react with the staining substances and improve the appearance of the tooth. The present article reports the successful bleaching of discolored non-vital, endodontically treated tooth using walking bleach technique with good prognosis.

4. CONCLUSION

Use of MTA as an apical plug in necrotized teeth with open apices can be considered to be a very effective method to complete obturation, thereby by reducing the treatment time. The main advantage of this procedure is the high predictability of apical

closure with the reduction of treatment time, number of appointments, and radiographs. Also, walking bleach technique is an important and valuable tool for management of discolored non-vital endodontically treated teeth in pediatric patients.

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Fig. 1: Preoperative photograph revealing laterally luxated maxillary right central incisor (11) and enamel-dentin fracture in relation to maxillary left central incisor (21)



Fig. 2: The tooth was digitally repositioned and splinted with a braided ligature wire orthodontic archwire using acid-etch composite technique



Fig. 3: A grayish discoloration of the tooth associated with pain suggestive of pulp necrosis was noted

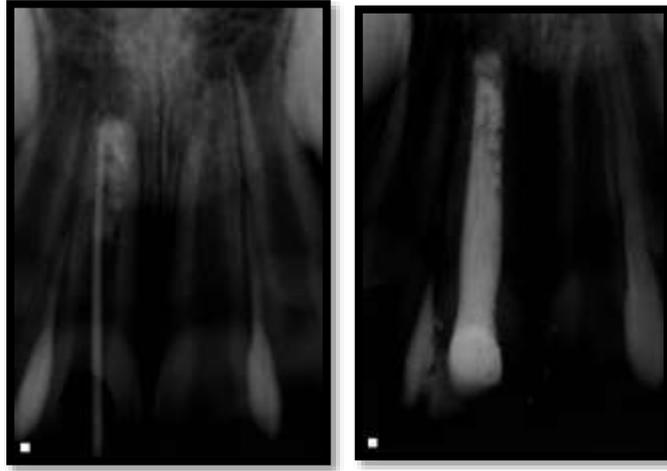


Fig. 4: Post-operative radiograph demonstrated a satisfactory obturation



Fig. 5: Postoperative photograph