

Case Report

Management of a Non-vital Discolored Tooth with an Open Apex using MTA and Walking Bleach Technique: A Case Report

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ABSTRACT

Trauma causes injury to the pulp causing necrosis. The necrotic agents or the hemolyzed products penetrate the dentinal tubules causing discoloration. Any traumatic injury causing necrosis at an early stage before the root completion causes the formation of open apex. A single visit apexification using mineral trioxide aggregate (MTA) is an efficient treatment option for open apices and has gained popularity in the recent times. For discolored teeth, bleaching is an effective alternative to direct and indirect restorations. In this case report, we have attempted to present successful treatment of a discolored maxillary incisor with an open apex with MTA followed by walking bleach technique.

Key words: Apexification, Bleaching, Mineral trioxide aggregate

INTRODUCTION

Completion of root formation and apical foramen closure continues for up to 3 years after the eruption of tooth.^[1] Pulp necrosis can develop if the pulp of young permanent teeth is injured before the apical foramen closes. Dentinal tubules in young teeth are wide, allowing bacteria and their irritants to penetrate. Therefore, after trauma occurrence of resorption of root is instant in such teeth. Root canal treatment should be done as soon as possible to inhibit the root resorption. Obtaining an apical seal is the most difficult aspect of endodontic therapy for these teeth. Apexification aims to stimulate the establishment of a hard tissue barrier at the root apex or the completion of apical development in non-vital immature teeth.^[2]

Mineral trioxide aggregate (MTA) is the most popular material suggested for creating an apical plug at the end of root as it helps in preventing the extrusion of the filling materials.^[3] The material is composed of tricalcium silicate, silicate oxide, and tricalcium oxide.^[4] When mixed with saline, a colloidal gel is formed, and its setting time is 3–4 h in the presence of moisture.^[5]

The hemolyzed products enter into the dentinal tubules causing intrinsic discoloration of the tooth due to pulpal necrosis.^[6] Furthermore, pulpal necrosis that occurs early in the apexogenesis process might lead to the creation of an open apex or a blunderbuss canal.^[7]

To restore the appearance and function of a trauma-induced discolored non-vital tooth with an open apex, thorough endodontic and esthetic restorative care are required. A single front tooth with discoloration, in particular, might be an esthetic challenge

since satisfactory results are infrequently achieved with direct and indirect restorative techniques.^[8]

This case report presents the management of a trauma induced intrinsically discolored non-vital open apex tooth by apexification using MTA followed by walking bleach technique.

CASE REPORT

A 24-year-old female patient reported to the department with the chief complaint of a discolored right upper front tooth for the past 6 years. The patient sustained trauma of the tooth following an accident 15 years back. On clinical examination, the maxillary right central incisor (11) was discolored, it was however asymptomatic [Figure 1]. Pulp vitality tests using Cold test (Endofrost) gave no response, suggestive of non-vitality. Radiographic examination revealed an open apex [Figure 2].

The case was diagnosed as a non-vital maxillary right central incisor with open apex. Single step apexification using MTA followed by walking bleach technique for esthetic management was the treatment planned.

Access cavity of 11 was prepared under rubber dam and the working length determined [Figure 3]. The root canal was instrumented using K-file of size no. 60 and copious irrigation was done using saline. To disinfect the root canal system calcium

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hydroxide (Prevest Denpro) was placed as an intra-canal medicament and the tooth was coronally sealed with temporary restoration.

Patient was recalled after a month, the canal was reentered, irrigated and calcium hydroxide was removed. MTA (Angelus) was mixed in a putty like consistency at the back of a dappen dish. It

was delivered to the apical portion of the canal using MTA carrier (GDC) to achieve a periapical plug of about 3–4 mm thickness [Figure 4]. Condensation of MTA at the apex was carried out using appropriate sized finger plugger (Dentsply). A subsequent radiograph was taken to confirm the apical position of the plug. A moist cotton pellet was placed inside the canal over the MTA plug to favor hydration process. The cavity was temporized.

Next day the patient was recalled and the hardset of the MTA was verified using an endodontic file. The canal was obturated with gutta percha cones (Dentsply Maillefer, Switzerland) using Custom cone technique (Rolled cone/Tailor made gutta-percha technique) [Figure 5].

After a week gutta-percha was removed 1 mm up to the level of cemento-enamel junction using Gates Glidden drill (Dentsply). Glass ionomer cement was placed as a bleaching barrier of 2 mm thickness. The access cavity was etched with 37% phosphoric acid to open the dentinal tubules for efficient bleaching results. A mixture of 30% hydrogen peroxide and sodium perborate, was made and placed in the pulp chamber over the GIC barrier



Figure 1: Pre-operative pictures discolored 11



Figure 2: Pre-operative pictures pre-operative radiograph



Figure 4: Operative pictures MTA apical plug

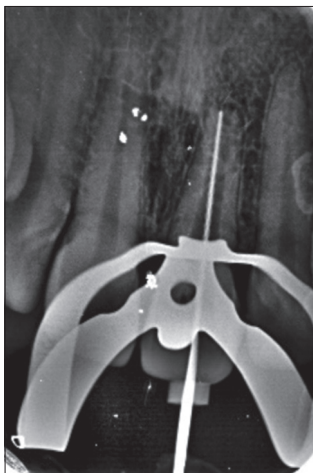


Figure 3: Operative pictures working length



Figure 5: Operative pictures obturation

using amalgam carrier. A cotton pellet moistened with hydrogen peroxide was placed over the bleaching material and the access cavity was closed using a temporary filling material.

The patient was recalled after every 10 days for review and the bleaching procedure was repeated till the desired shade of the adjacent left central incisor was obtained [Figure 6]. Radiographs were taken in follow-up visits to rule out resorption episode. After obtaining the desired shade, the bleaching mixture was removed, and the pulp chamber was flushed with water. The access cavity was then subsequently restored with resin composite material (Ivoclar). A 12 month follow-up showed no re-discoloration and the bleached shade was maintained. Follow-up radiograph showed no evidence of cervical resorption [Figure 7].

DISCUSSION

Earlier calcium hydroxide was the most commonly used material for apexification. However, it had some disadvantages like the treatment requires a very long time which is from 3 to 21 months.^[3] The required time is dependent on the diameter of the open apex.^[9] The leakage from the temporary coronal filling might reinfect the root canal over a long period of time. As a result, performing a permanent treatment is preferable since it prevents the root canal from becoming infected again. There is also the risk of the fracture



Figure 6: Post-operative pictures post-operative (Post bleaching)



Figure 7: Follow-up radiograph (12 months)

of weak teeth with incompletely formed roots. In the calcium hydroxide apexification procedure, patient complaints may include several sessions and esthetic issues.^[10]

Creating an MTA apical plug in a single visit has recently been proposed as an alternative to long-term apexification therapy for non-vital immature permanent teeth. MTA is a material which has less leakage, better antibacterial properties, high marginal adaptation, short setting time (~4 h), a pH of 12.5 and is more biocompatible.^[8,11] Scaffolding is provided for the hard tissue barrier by MTA.^[4,12] MTA is a bioactive material that stimulates the release of interleukins and cytokine. Hence, it has the capability of promoting the formation of hard tissues.^[5,13] MTA also reinforces the thin dentinal walls by increasing the fracture resistance. It sets in the presence of moisture, thus can be used in teeth with inflamed pulp and periapical abscess.^[14,15]

Nutting and Poe in 1963 modified the earlier concept of perborate technique as walking bleach technique by the addition of 30% hydrogen peroxide to the bleaching mixture, thus increasing the bleaching effectiveness.^[3,4] Intra coronal bleaching is a valuable treatment option; however, it comes with risks such as external cervical resorption (ECR) and re-discoloration.^[6]

Plotino advocated the use of adhesive temporary filling to prevent leakage of the bleaching agent. ECR is caused by the initiation of a local inflammatory reaction in the cervical periodontal ligament as a result of hydrogen peroxide penetration via the patent dentinal tubules. The placement of a barrier prevents this resorption by obstruction of peroxide into the periodontium.^[7]

In the presented case report, GIC was used as barrier material instead of commonly used other materials such as IRM (Modified Zinc Oxide Eugenol), MTA, and Resin Modified GIC. When used as a barrier material, GIC's superior physiochemical qualities may be advantageous. It has superior sealing property when used as a barrier material. In the present case, a mixture of hydrogen peroxide with sodium perborate was used as the bleaching agent.^[8]

Intracoronary bleaching efficiency of 10% hydrogen peroxide against 10% carbamide peroxide was compared by Ganesh *et al.* and it was concluded that hydrogen peroxide group showed better results.^[16]

At present, different treatments options are available to activate the bleaching agent. Laser assisted activation technique by accelerating the concentration of free radicals have shown successful outcome. An *in vitro* Laser [Er, Cr: YSGG] assisted intracoronary bleaching by Mohammadi *et al.* showed results which were comparable to conventional technique.^[17]

MTA is an effective apexification material because it requires less treatment time, visits, and radiographs, and it has a higher fracture resistance after treating non-vital immature permanent teeth.

When compared to direct and indirect restorative modalities, "walking bleach" is a viable therapy option for a single discolored tooth if procedural protocols and precautions are rigorously followed.

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