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From apex to aesthetics: A comprehensive approach to managing non-vital teeth with open apex

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Abstract

Managing non-vital immature teeth with open apices is clinically challenging due to the absence of apical constriction and risk of reinfection. Mineral Trioxide Aggregate (MTA) offers a reliable solution, promoting hard tissue formation and providing an effective apical seal. Single-visit apexification with an MTA apical plug offers a time-efficient approach, promoting reliable apical sealing and tissue healing. For esthetic concerns, the walking bleach technique effectively addresses discoloration in non-vital teeth without compromising structure. The combined approach restores both function and appearance, with clinical success attributed to MTA's antibacterial properties and calcification-inducing potential. This conservative and reproducible protocol provides an efficient strategy for managing open apex cases in contemporary endodontic practice.

Keywords: Apexification, Mineral Trioxide Aggregate (MTA), open apex, non-vital teeth, walking bleach technique

Introduction

The aesthetic rehabilitation of a discolored tooth with an open apex presents distinct clinical challenges for dental practitioners. The "open apex" refers to an incomplete or underdeveloped root end, typically seen in immature teeth or those with trauma or infection^[1]. This can complicate endodontic therapy due to the absence of an apical barrier as well as lead to complications such as persistent infection or root fracture. A discolored tooth, often resulting from pulp necrosis or trauma, requires careful attention, as it impacts patient's self-esteem and oral health. Leaching of hemolysed products into the dentinal tubules result in discolouration ranging from light yellowish shades to darker, almost black hues, often complicating the aesthetic outcomes^[2]. The aesthetic management of such cases requires a holistic approach that integrates endodontic management, internal bleaching and restorative solutions. Endodontic management deals with the open apex through apexification or apexogenesis and prevents further damage. Discoloration of non-vital teeth can be effectively managed through internal bleaching following proper root canal sealing. For optimal aesthetic outcomes, restorative options such as composite resins, crowns, or veneers may be employed to mask residual staining and restore natural appearance. The following case report presents the management of a trauma induced intrinsically discolored non-vital open apex tooth by "walking bleach" technique along with the use of mineral trioxide aggregate (MTA) as an apical plug.

Case report

A 29 years old female patient reported to the Department of Conservative Dentistry and Endodontics, Dayanand Sagar College of Dental Sciences, Bengaluru, with a chief complaint of discoloured upper left front tooth since 8 years. Patient gave history of fall 10 years back and root canal treatment initiated on the same tooth 3yrs back. On clinical examination, discoloured maxillary left lateral incisor (22) with temporary filling was noted (Fig 1). Radiographic examination revealed radiopacity seen extending from the crown to the in the cervical third of the root suggestive of filling material; wide canal and open apex with periapical hazy radiolucency (Fig 2).



Fig 1: Pre- operative picture



Fig 2: Pre- operative radiograph

A final diagnosis of previously initiated root canal treatment with asymptomatic apical periodontitis in relation to 22 was established. One step apexification, using Mineral Trioxide Aggregate (MTA), followed by “walking bleach” technique for aesthetic management was proposed and informed consent was obtained from the patient. Under rubber dam isolation, following the removal of temporary access restoration, working length was determined with #80 K file using apex locator and confirmed radiographically. (Fig 3) Circumferential filling was done using 30 H-file. The canals were copiously irrigated with 2% chlorhexidine (SafeEndo Hexachlor) and dried with paper points. Calcium hydroxide (RC-Cal; Prime Dental Ltd) was placed as intra canal medicament and was temporised (Smart Temp; SafeEndo) (Fig 4). Patient was recalled after 2 weeks.



Fig 3: Working length radiograph- 15mm



Fig 4: ICM radiograph

The intra canal medicament (ICM) was removed using saline. The final irrigation was done using 17% EDTA (DeSmear Anabond). Canals were dried using sterile paper points. Biostructure MTA Putty (SafeEndo) was delivered at the apical portion of the canal in order to achieve a periapical plug of 4 mm thickness. Condensation of MTA at the apex was carried out using Schilder's plugger and a subsequent intraoperative radiograph was taken to confirm its apical position. A moist cotton pellet was placed inside the canal over the MTA plug to favor hydration process. Next day the patient was recalled and the hard set of the MTA was verified using endodontic file. The canal was obturated using thermoplastic obturation technique (Sybron Endo Elements Obturation Unit) (Fig 5).

Baseline shade of 5M2 was obtained in relation to 22 using Vita 3D Master shade guide (Fig 6). 2mm of RM GIC (GC Fuji Plus RM GIC) was placed as intraorifice barrier.



Fig 5: Apical plug and RM GIC barrier



Fig 6: Baseline shade

35% hydrogen peroxide (Opalscent Endo; Ultradent) was placed in the pulp chamber and temporized with GIC. The patient was recalled after every 5 days for review and the bleaching procedure was repeated till the desired shade of the adjacent left central incisor was obtained. Radiographs were taken in follow-up visits to rule out resorption episode. The desired shade obtained was 3L1.5 determined using Vita 3D Master (Fig 7). The bleaching agent was removed and patient was recalled after 2 weeks and access cavity was restored using resin composite (Filtek Z350, 3MESPE, MN, USA) (Fig 8). A 6 months follow-up showed no re-discolouration (Fig 9) and the bleached shade was maintained. Follow-up radiograph showed no evidence of cervical resorption.



Fig 7: Post-op picture



Fig 8: Post-op radiograph



Fig 9: 6 months follow up

Discussion

Apexification facilitates an environment conducive to the deposition of cementum, bone, and periodontal ligament,

thereby supporting continued root development [3]. The primary objective of this procedure is to establish an apical barrier that blocks the migration of toxins and microorganisms from the root canal into the periapical tissues. This barrier also enables effective compaction of the root canal filling material [4].

In 1993, Mahmoud Torabinejad and colleagues at Loma Linda University introduced Mineral Trioxide Aggregate (MTA) as a root-end filling material. MTA functions as a primary monoblock, and during its maturation, appetite-like interfacial deposits form, which help fill gaps created during the material's shrinkage phase. These deposits enhance the frictional resistance of MTA against canal walls and contribute to its sealing ability through the formation of non-bonding, gap-filling appetite crystals [5]. MTA offers several clinical advantages, including reduced treatment duration, immediate tooth restoration, and no reported negative impact on the mechanical integrity of root dentin. [6] A prospective study demonstrated that apexification using MTA resulted in high rates of healing and apical closure [7]. Research by Krupal M *et al.* indicated that placing MTA 2 mm short of the working length still led to the formation of a radiographically visible apical barrier [8] suggesting that the exact apical extent of the MTA plug does not significantly affect treatment outcomes. Despite its benefits, MTA presents challenges in handling and carries a risk of extrusion. These issues can be mitigated by using matrices such as calcium sulfate, hydroxyapatite, collagen, or platelet-rich fibrin, as suggested by Lemon *et al.* [9].

The walking bleach technique is a conservative method for improving the aesthetics of discolored non-vital teeth. Vilhena *et al.* (2019) reported that excessive use of bleaching agents over extended periods (21-28 days) can degrade the enamel's organic matrix, alter calcium and phosphorus levels, and expose enamel prisms, potentially leading to external cervical resorption [10]. Additionally, residual oxygen in enamel and dentin post-bleaching may compromise the bond strength of restorative materials [11]. Therefore, a waiting period of at least two weeks or the application of antioxidants such as sodium ascorbate, alpha-tocopherol, green tea extract, grape seed extract, glutathione, or catalase is recommended before final restoration [12].

Conclusion

Effective treatment of open apex cases requires a comprehensive understanding of root anatomy and the selection of appropriate therapeutic materials. Agents with antimicrobial properties and the capacity to stimulate calcific barrier formation are essential for successful outcomes. One-visit apexification using MTA and the walking bleach technique are reliable and reproducible approaches that support periapical healing, apical closure, and aesthetic rehabilitation with minimal invasiveness.

References

1. Bansal R, Bansal R. A comparative evaluation of various materials used in apexification. *Int J Clin Exp Dent Sci.* 2012;1(1):1-6.
2. Nizami B, Lawson NC, Algiers J, Robles A, Bedrossian EA. Tooth discoloration following exposure to hemostatic agents: photographic and descriptive pilot study. *J Cosmetic Dent.* 2022;38(4):42-49
3. Singh DK, Subhalaxmi, Jalaluddin M. Evolution and development of periodontium. *Int J Creative Res Thoughts.* 2021;9(4):555-565

4. Jaikaria A, Negi P, Kukreja S. Apexification: Use of MTA and Biodentin to form apical barrier in immature permanent teeth. *Int J Appl Dent Sci*. 2019;5(4):156-158.
5. Kumar Das U, Mazumdar P, Bhattacharyya S. Building the barrier: A comparison of Mineral Trioxide Aggregate and Calcium Hydroxide in apical barrier technique. *Int J Adv Res Biol Sci*. 2014;1(6):122-127.
6. Jayakumar M, Shashikala K, Rao HM. MTA: A review of literature with clinical applications. *IOSR J Dent Med Sci*. 2018;17(3):4-11
7. Banerjee M, Ghosh A. Evaluation of periapical healing after apexification with MTA using radiographic grid: An *in vivo* study. *IOSR J Dent Med Sci*. 2023;22(5):1-7.
8. Tabiyar KM, Logani A. The apical extent of mineral trioxide aggregate apical barrier does not influence the treatment outcome in a nonvital immature permanent anterior tooth: A split-mouth clinical study. *Eur Endod J*. 2021;6(1):44-49
9. Lemon RR. Nonsurgical endodontic therapy using a collagen calcium phosphate apical barrier technique. *Dent Clin North Am*. 1992;36(2):327-351.
10. Vilhena KFB, Nogueira BCL, Fagundes NCF, Loretto SC, Angelica RS, Lima RR, *et al*. Dental enamel bleached for a prolonged and excessive time: Morphological changes. *PLoS One*. 2019;14(4):e0214948.
11. Ferraz LN, Oliveira ALBM, Grigoletto M, Botta AC. Methods for reversing the bond strength to bleached enamel: A literature review. *JSM Dent*. 2018;6(1):1105.
12. Güleç Alagöz L, Karadağhoğlu İ, Ulusoy N. Antioxidants used in restorative dentistry. *Cyprus J Med Sci*. 2019;4(2):141-145.

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