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Case Report

# One-visit apexification and esthetic rehabilitation of an open apex with large periapical lesion: A case report

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## Abstract

This case report presents the successful management of a 19-year-old male with a non-vital maxillary central incisor and open apex. Apexification was done using mineral trioxide aggregate (MTA) to form an apical barrier, followed by restoration with a glass fiber post and ceramic crown. MTA was chosen for its biocompatibility and sealing ability, addressing the challenge of obturating an open apex. The glass fiber post reinforced the weakened root, while the ceramic crown restored function and esthetics. This case highlights the effectiveness of combining endodontic and restorative techniques for predictable outcomes in complex cases.

**Keywords:** Case report, Open apex, Apexification, Mineral trioxide aggregate (MTA), Immature tooth

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## 1. Introduction

Immature permanent teeth that suffer trauma during development often present with open apices and thin radicular dentin, posing significant challenges for endodontic and restorative procedures.[1] The absence of a natural apical constriction complicates working length determination and obturation, while the fragile dentinal walls increase susceptibility to fracture. Apexification is defined as 'a method to induce a calcified barrier in a root with an open apex or the continued apical development of an incomplete root in teeth with necrotic pulp.[2] Traditionally, calcium hydroxide apexification was employed to induce apical closure through the formation of a calcific barrier, but this technique required multiple visits and prolonged treatment durations, and was associated with a higher risk of root fracture due to long-term dressing.[3]

Mineral trioxide aggregate (MTA), introduced in the 1990s by Torabinejad, has revolutionized apexification procedures by enabling the creation of an artificial apical barrier in a single visit.[4,5] Composed primarily of tricalcium silicate, dicalcium silicate, tricalcium aluminate, and bismuth oxide, MTA is a calcium silicate–based hydraulic cement that sets through a hydration reaction, forming a colloidal gel that hardens into a solid matrix. It is highly biocompatible, bioactive, and exhibits excellent sealing properties due to its expansion upon setting. MTA also possesses intrinsic antimicrobial activity, attributed to its high alkaline pH, which helps eliminate residual microorganisms within the canal and promotes periapical healing. Furthermore, it releases calcium ions during the setting process, stimulating hard tissue formation by activating cementoblasts and osteoblasts and facilitating deposition of cementum and new bone at the apex.[6] Its ability to set in the presence of moisture and blood makes it particularly suitable for cases with persistent periapical exudation or open apices.

Once endodontic stability is achieved, these teeth benefit from radicular reinforcement to restore structural integrity.[7] This report describes the management of an open apex case using MTA apexification, followed by rehabilitation with a glass fiber post and ceramic crown.

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## 2. Case Report

A 19-year-old male presented to the Department of Conservative Dentistry and Endodontics at IGGDC Jammu with a mild continuous pain in the upper front tooth region for a week. Clinical examination of tooth 11 revealed a complicated crown fracture with evident discoloration and positive tenderness on percussion (**Figure 1**). The patient had a history of dental trauma approximately 10 years prior. A radiographic examination of tooth 11 showed an immature open apex, thin root dentin walls associated with a large periapical radiolucency (**Figure 2**). Pulp vitality tests yielded negative responses, and a diagnosis of symptomatic periapical abscess was established. The treatment plan involved performing apexification with mineral trioxide aggregate (MTA), followed by rehabilitation using a glass fiber post and a full coverage restoration.

**Figure 1:** Pre-operative picture

**Figure 2:** Pre-operative radiograph

Endodontic treatment was initiated under local anesthesia using 2% lidocaine containing 1:100,000 epinephrine. After establishing access and working length (**Figure 3**), minimal mechanical instrumentation was performed with hand K-files (Mani, New Delhi, India) and ProTaper Universal rotary files (Dentsply Maillefer). The canal was irrigated using 5.25% sodium hypochlorite and saline, followed by placement of calcium hydroxide paste (Calcigel, Prevest Denpro, Pvt, Ltd.) for two weeks. At the follow-up visit, the paste was removed, and the canal was thoroughly irrigated with alternating solutions of 5.25% NaOCl and 17% EDTA. A 3–4 mm apical plug of MTA (Root Plus MTA, Ammdent) was placed using a carrier (**Figure 4**), and a moist cotton pellet was positioned over it to allow proper setting.

**Figure 3:** Working length radiograph

**Figure 4:** Apexification with MTA

At the subsequent appointment, MTA setting was confirmed. Given the thin dentinal walls, radicular reinforcement was deemed necessary. A pre-fabricated glass fiber post system was selected (Coltene, Tenax Fiber Post). A dentin bonding agent (Single Bond Universal, 3M ESPE) was applied and light-cured for 20 seconds, followed by luting of the glass fiber post using dual-cure resin cement (Rely X Ultimate, 3M Espe) and light-cured for 40 seconds each from both the facial and palatal sides (**Figure 5**). Composite core buildup was performed and finalized with tooth preparation.

**Figure 5:** Glass fiber post luted

An impression was taken using a putty-wash technique, and a ceramic crown was fabricated and cemented (**Figure 6**).

The patient was followed up at 6 months, with no clinical symptoms and radiographic evidence of periapical healing (**Figure 7**).

**Figure 6:** Postoperative picture

**Figure 7:** Follow up radiograph

## 3. Discussion

Endodontic treatment of teeth with open apices requires careful planning due to the absence of a natural apical constriction and the increased risk of root fracture. Apexification is defined as 'a method to induce a calcified barrier in a root with an open apex or the continued apical development of an incomplete root in teeth with necrotic pulp'. A key objective of using a root-end filling material in such cases is to effectively seal the apical portion of the canal and establish a hermetic barrier between the root canal system and the surrounding periodontium. Mineral trioxide aggregate (MTA), a calcium silicate-based material, has emerged as the material of choice for apexification because of its excellent biocompatibility, ability to set in the presence of moisture, and its capacity to stimulate hard tissue formation.

The clinical outcome in the present case — successful formation of an apical barrier, periapical healing, and restoration of tooth function — is consistent with previous reports in the literature. Simon et al. (2007) reported an 81% clinical success rate with one-visit MTA apexification, based on reduction of periapical pathology and radiographic evidence of healing 8. Similar findings were described by Felippe et al. (2006), who demonstrated effective apical barrier formation and favorable healing patterns when MTA was used in teeth with open apices.[9]

Post-endodontic rehabilitation plays a crucial role in improving the long-term prognosis of such teeth, which are structurally compromised due to thin dentinal walls and wide canals. In this case, reinforcement with a glass fiber post provided internal support, improved stress distribution, and enhanced fracture resistance. This approach aligns with the findings of Ferrari et al. (2000), who reported that fiber posts with a modulus of elasticity similar to dentin significantly reduce the risk of root fracture and improve the longevity of endodontically treated teeth.[10] Additionally, the combination of adhesive luting techniques and composite resin core buildup further strengthens the restored tooth and enhances its functional performance.[11]

The successful outcome of this case demonstrates that MTA apexification, followed by radicular reinforcement with a glass fiber post and full-coverage restoration, provides a predictable and biologically sound approach to the management of immature permanent teeth with open apices. These findings corroborate previously published data and support the use of MTA as the preferred material for apexification in contemporary endodontic practice.

## 4. Conclusion

MTA apexification followed by internal reinforcement using a glass fiber post and ceramic crown provides an effective, conservative, and esthetically satisfactory treatment modality for non-vital teeth with open apices. This approach ensures long-term structural integrity, function, and patient satisfaction, making it a viable option in similar clinical scenarios.

## 5. Source of Funding

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## 6. Conflict of Interest

None.

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