MTA apical plug in non-vital permanent tooth with an open apex: A case report

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Abstract

Objective: This case report discussed the treatment of an open apex using an MTA apical plug in a non-vital permanent tooth.

Methods: A 39-year-old female visited the Dental Hospital of Hasanuddin University with the chief complaint of decay in her upper front tooth. The tooth was filled, and it fell out a few weeks ago. There is a history of gingival swelling a month before. Radiographic examination showed an open apex #11 with radiolucency in the apical area. Diagnosis was necrosis with a chronic apical abscess. The root canal was prepared using circumferential techniques. Then, dressing using calcium hydroxide was given. MTA was used to perform an apical plug a few weeks later, then proceed with bilaminar technique until the crown was fashioned.

Results: Patient showed no complaints of pain, and the size of the radiolucency in the periapical area of the tooth was reduced. Following that, a post crown was created on #11.

Conclusion: MTA apical plugs are effective to treat non-vital permanent tooth with an open apex.

Keywords: Apexification, MTA apical plug, Open apex

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Introduction

Complete root formation occurs about three years after the tooth has erupted. If during this interval the tooth becomes necrotic due to deep caries, pulpal and periapical abnormalities, and trauma, then root dentine formation will stop. This condition causes the teeth to have several characteristics, such as open roots, wide root canals, and fragile walls.1,2 Teeth with necrosis require root canal treatment. Treatment outcomes depend on diagnosis, proper instrumentation, disinfection and sealing, and obturation of the root canal system. Optimal filling of the root canal system with an open apex is a challenge for dentists.2 Treatment of an open apex can be done by apexification, which aims to form a calcific or artificial barrier so as to prevent extrusion of the sealer and gutta percha in the periapical area.2

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A 39-year-old woman visits the Dental Hospital of Hasanuddin University with the chief complaint of decay in her upper front tooth. The tooth was filled, and it fell out a few weeks ago. There is a history of gingival swelling a month before. Intraoral examination showed that tooth #11 had mesial caries with negative vitality, percussion and palpation tests, and a fistula in the palatal area. Diagnosis was necrosis with a chronic apical abscess. Planned root canal treatment with the MTA apical plug procedure and post crown restoration.

At the first visit, KIE was carried out and informed consent was given to the patient. Isolation of the work area using a rubber dam, removal of carious tissue, and access openings on tooth #11. The determination of working length using K-file #50 and radiographic confirmation obtained a working length of 23mm. Furthermore, root canal preparation was performed circumferentially using K-files #50–#80, accompanied by 1.5% NaOCl irrigation, sterile aquadest, and 17% EDTA. On the labial and mesial surfaces of the tooth, composite restorations were performed. Administration of intracanal medicaments with calcium hydroxide...
good condition. Try-in post with a diameter of 1.8 (NexPost, Meta Biomed) and insertion using adhesive resin cement (Luxacore). After that, the crown preparation and impression were carried out using the double impression technique. Next, insertion of a temporary crown. Determination of tooth color 3M1 (Vita 3DM Daisy) with plans for making zirconia crowns.

On the fourth visit, subjective and objective examinations had no complaints. A try-in was performed and the insertion of the zirconia crown on tooth #11. The adaptation of the restoration margin is good, the tooth color matches, and the tooth can function properly.

Discussion

Hertwig epithelial root sheath (HERS) cells play an essential role in the development of the tooth root. HERS cells give stem cells in the apical papilla inductive cues so they can differentiate into odontoblasts and make root dentin. Through interactions between epithelial-mesenchymal cells, HERS cells can also direct dental follicle stem cells to differentiate into cementoblasts and make cement. HERS cells can also transform into cementoblasts through the epithelial-mesenchymal transformation. Therefore, the rise in root length, apical closure, and root canal wall thickness is caused by HERS cells. Root growth typically halts in immature permanent teeth with pulp necrosis or apical periodontitis. Interleukin 1 and tumor necrosis factor alpha are examples of proinflammatory cytokines that are produced when infection or inflammation affects the pulpal-periapical tissue complex.

Necrotic teeth with an open apex can be treated with apexification. The aim of apexification is to induce an apical barrier to prevent bacterial toxins from entering the periapical area of the root canal system. Materials that can be used for this procedure are Ca(OH)2, MTA, or bioceramic. The most popular method is calcium hydroxide-induced long-term development of the apical barrier. Using Ca(OH)2 material for conventional apexification has a number of disadvantages, including variable treatment times, uncertain apical closure, challenging patient follow-up, inability to control infection, recurrent infections, cervical fractures, and an elevated risk of root fracture.

The placement of MTA for apexification can serve as an artificial barrier or apical plug. This material consists of good hydrophilic particles, i.e., tricalcium silicate, silicate oxide, (Ca(OH)2) and temporary fillings in the palatal area.

On the second visit, the results of a subjective examination revealed no complaints, the gingiva was normal, and the temporary restoration was in good condition. Cleaning of Ca(OH)2 was carried out with sterile aquadest and then irrigated with 1.5% NaOCl, aquadest, and 17% EDTA. Then, ±4mm of MTA was applied in the apical area using an MTA carrier and condensing with a hand plunger. Confirm with radiography, cover with moist cotton, and then do a temporary restoration.

The subjective examination on the third visit revealed no complaints, the gingiva was normal, and the temporary restoration was in good condition.
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and tricalcium oxide. The advantages of MTA include reducing treatment time, superior bicompatibility, and the presence of calcium and phosphate ions, which initiate blastic cells and provide a favorable environment for cementum deposition. 

On the first visit, caries tissue removal, access opening, root canal preparation, and root canal medicament with Ca(OH)2 were performed. Teeth with an open apex have greater interaction with the periapical area than teeth with a closed apex. Therefore, root canal disinfection should be carried out prior to obturation. Adequate irrigation with NaOCl and Ca(OH)2 dressing can promote periapical healing and the elimination of remaining necrotic tissue and bacterial products after cleaning and shaping. After that, MTA placement can be done using an MTA carrier and an endodontic plugger.

In this case, the MTA was placed 4 mm thick. According to a study by Matt et al., MTA with a thickness of 5 mm is significantly stronger and leaks less than MTA with a thickness of 2 mm. Scientific articles show that placement of MTA as an apical plug at the open apex shows that a thickness of 4 mm is significantly more resistant than a thickness of 1 mm.

Conclusion

Post-core-crown restoration using direct mono-block technique using composite resin material shows good results and is aesthetically acceptable after 3 months follow-up.

Acknowledgment

None.

Conflict of Interest

The authors report no conflict of interest.

References


Figure 4. A. Crown preparation on labial surface, B. Crown preparation on occlusal surface, C. Tooth color determination

Figure 5. Zirconia crown. A. Try-in, B. Insertion