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Endodontic management of a traumatized maxillary central incisor with open apex by MTA apexification

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Abstract

Managing teeth with an open apex necessitates meticulous care and attention in clinical procedures. The success of endodontic treatments in these situations is closely tied to the effectiveness of apical sealing. In the past, a calcified barrier created with calcium hydroxide was advocated for these conditions; however, due to the various limitations associated with this method, the current practice recommends apexification via an apical plug at the apex of the tooth. This report presents apexification in an upper left incisor utilizing a mineral trioxide aggregate plug. After a follow-up period of 6 months, the tooth remained asymptomatic clinically and radiographically, with visible healing observed in the apical region.

Keywords: Apical plug, MTA, Apexification.

Introduction

Trauma to anterior teeth is prevalent during childhood, with almost 30% of the trauma in children and young adults. The diagnosis and treatment of an immature permanent tooth which is followed by traumatic injury is a challenge for clinicians.

Traumatic injuries often result in pulpal inflammation or necrosis hampering the development of the dentinal wall and root apices in the immature tooth, short roots (altered crown-root ratio) with very thin walls, root

resorption in long-standing cases, and a greater risk of fracture.

Difficulties associated with large open apices involve establishing the correct working length, preparing the root canal, and maintaining control during the obturation process. The challenges in filling a tooth that has an open apex stem from the absence of an apical barrier, which permits bacteria and toxins to seep into the periapical area.

Apexification is described as a technique aimed at creating a calcified barrier in a root with an open apex or facilitating the further development of a root that is not fully formed in teeth with necrotic pulp. The traditional apexification method involves encouraging the formation of an apical barrier, while the more modern technique focuses on creating an artificial apical barrier through the use of an apical plug. Various materials have been utilized to promote the development of a hard tissue barrier, including Calcium hydroxide, Mineral Trioxide Aggregate, Biodentine, and Endosequence.

Calcium hydroxide has often been employed as an intracanal dressing to stimulate hard tissue formation in cases of open apices. This material is replenished regularly until the apical barrier is successfully formed. The duration required to establish an apical barrier is variable and typically spans from 6 to 18 months, influenced by factors such as the size of the apical foramen, the presence of infection, and the host's response.

Mineral Trioxide Aggregate (MTA) is regarded as one of the most promising materials due to its excellent biocompatibility and lower cytotoxicity, attributed to its alkaline pH and the presence of calcium and phosphate ions that help attract blastic cells and create favorable conditions for cementum deposition.

This article discusses the effective treatment of a traumatized, necrotic permanent maxillary central incisor with an open apex due to resorption using MTA to create an artificial apical barrier.

Case report

A 20-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of pain in the upper left front tooth region. On clinical examination, 11 with Ellis class IV fracture in 21 were missing. Tooth 21 showed tenderness on percussion. EPT showed no response about 21 with no mobility. Radiographic examination showed an immature open apex.

Apexification with MTA was decided as the treatment plan. Isolation was done, and an access cavity was made with 21. Cleaning and shaping were done, along with copious irrigation of a 5.25% sodium hypochlorite solution. Calcium Hydroxide was placed for two visits, and the patient became asymptomatic. MTA was placed at the third visit, and obturation was done in the next appointment after three days using the thermoplasticized gutta-percha technique. The patient was reviewed every six months.

Figure 1: Preoperative clinical photograph

Figure 2: Pre-operative radiograph with 21

Figure 3: Isolation done and access cavity modified with 21

Figure 4: Working length Determination with 21

Figure 5: Intracanal medicament ca(oh)2 placement for 2 weeks with 21

Figure 6: MTA plug placement with 21

Figure 7: Obturation done with 21 using thermoplasticized technique

Figure 8: Preoperative clinical photograph

Figure 9: 6 months follow-up radiograph

Discussion

In the past, the most prevalent method for inducing a calcified barrier involved the prolonged application of CaOH2 to achieve a biological seal in teeth with incomplete root development. Although this technique demonstrated clinical effectiveness, it also had numerous drawbacks, such as an extended duration that necessitated the patient's adherence, the risk of re-infection from temporary sealing, and the potential for tooth fractures during or after treatment. To mitigate

these risks, various studies have suggested one-visit apexification by utilizing MTA, which is a viable alternative due to its beneficial physiochemical properties, biocompatibility, and high rates of clinical success. After this procedure, it is feasible to obturate the canal and place a coronal restoration. Therefore, for the case discussed, an apical plug obturation was deemed the most suitable choice as it required immediate restoration.

The cellular response to MTA and the process through which deposition occurs in barrier formation remain unclear and need to be further explored.

Mineral trioxide aggregate acts as a fundamental monoblock for apexification. During the maturation of MTA, apatite-like interfacial deposits develop, which help to fill the gap created during the material's shrinkage phase and enhance its frictional resistance against root canal walls. The creation of non-bonding and gap-filling apatite

crystals contribute to the excellent sealing ability of MTA.

MTA demonstrates superior biocompatibility and exhibits lower cytotoxicity, owing to its alkaline pH and the inclusion of calcium and phosphate ions in its composition, which enhance its potential to attract blastic cells, thereby fostering a conducive environment for cementum deposition.

Advantages of Mineral Trioxide Aggregate (MTA):

-Outstanding biocompatibility,

-Ability to set in the presence of blood, and the possibility to restore teeth in one to two visits.

-Retains the mechanical properties of dentine.

In a study by Simon S et al., apexification treatment with MTA showed a high prevalence of healing and apical closure. Reviewing the above factors, single-step apexification was done using MTA in this case.

Conclusion

Bio-regenerative and highly biocompatible material like Mineral Trioxide Aggregate (calcium silicate) based single-visit apexification serves to be a better option for open apex cases to achieve a higher success rate. Apexification using MTA showed promising results in both cases as a root end-filling material

References

1. Janardhanan, Chitra & Vekaash, Vejai & Reddy, Tripuravaram Vinay & Reddy, Kumar & Sivakumar, Murali & Venkatesh, Vijay. (2017). Apexification using MTA -2 case reports. 149-150. 10.21276/sjds.2017.4.3.14.
2. Dr. Pradnya V. Bansode,Dr. Seema D. Pathak,M. B. Wavdhane,Dr Aarti U. Pathak, "Management Management Of Open Apex Through Apexification Using Mta And Prf Apical Plug : A Case Report", International Journal of Creative Research Thoughts (IJCRT), ISSN:2320-2882, Volume.11, Issue 4, pp.g573-g578, April 2023,
3. Martos J, Nascimento CN, Collares KF, Silveira LF. Trauma in permanent central incisor with crown fracture treated by direct restoration. Journal of Pediatric Dentistry. 2013 Jan 1;1(1):24.
4. Mishra L, Kumar M. Rehabilitation of fractured tooth by a custom made fibre reinforced composite post. Int J Odontostomat. 2012; 6(3):323–26.
5. Gojanur S, Yeluri R, Munshi AK. Prevalence and etiology of traumatic injuries to the anterior teeth among 5 to 8 years old school children in mathura city, india: An epidemiological study. International journal of clinical pediatric dentistry. 2015 Oct 10; 8(3):172-5.
6. Rule DC, Winter GB. Root growth and apical repair subsequent to pulpal necrosis in children. British dental journal. 1966 Jun; 120(12):586-90.

7. Gutmann JL, Gutmann MS. Cause, incidence, and prevention of trauma to teeth. Dent Clin North Am 1995;39(1):1-13.
8. Zogheib LV, Pereira JR, do Valle AL, de Oliveira JA, Pegoraro LF. Fracture resistance of weakened roots restored with composite resin and glass fiber post. Braz Dent J 2008;19(4):329-33
9. Al Ansary MA, Day PF, Duggal MS, Brunton PA. Interventions for treating traumatized necrotic immature permanent anterior teeth: inducing a calcific barrier & root strengthening. Dent Traumatol 2009;25(4):367-79.
10. Bargholz C Perforation repair with mineral trioxide aggregate: A modified matrix concept. Int Endod J. 2005; 38:59-69.
11. AAE Glossary of Endodontic Terms, 7th ed, American Association of Endodontists, Chicago, 2003.
12. Sheehy EC, Roberts GJ: Use of calcium hydroxide for apical barrier formation and healing in non-vital immature permanent teeth: a review. British Dental Journal 1997; 183, 241-246.
13. Chosack A, Sela J, Cleaton-Jones P: A histological and mquantitative histomorphometric study of apexification of non-vital permanent incisors of vervet monkeys after repeated root filling with a calcium hydroxide paste. Endodontics and Dental Traumatology 1997; 13, 211-
14. Fellippe WT. Felippe MC, Rocha MJ: The effect of mineral trioxide aggregate on the apexification and periapical healing of teeth with incomplete root formation. Int Endod J 2006; 39, 2-9.
15. Abu-Hussein M.,Abdulghani A.,Abu-Shilabayeh H.,; Mineral Trioxide Aggregate (MTA) in apexification ENDODONTOLOGY 2013, 25(2) ,97-101
16. Torabinejad M, Chiavian N: Clinical applications of mineral trioxide aggregate. J Endod 1993; 25, 197-205.
17. Toffler M, Toscano N, Holtzclaw D, Del Corso M, Ehrenfest D JIACD Continuing Education Introducing Choukroun's Platelet Rich Fibrin (PRF) to the Reconstructive Surgery Milieu. The Journal of Implant & Advanced Clinical Dentistry. 2009; 1:21-3.
18. Huang FM, Yang SF, Zhao JH, Chang YC Platelet-rich fibrin increases proliferation and differentiation of human dental pulp cells. J Endod. 2010;36:1628-31
19. Gaßling VLW, Açil,Y, Springer IN, Hubert N, Wiltfang J Plateletrich Plasma and Platelet-rich fibrin in human cell culture. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2009; 108:48-55.
20. Simonpieri A, Del Corso M, Sammartino G, Dohan Ehrenfest DM The Relevance of Choukroun's Platelet-Rich Fibrin and Metronidazole during Complex Maxillary Rehabilitations Using Bone Allograft. Part II: Implant Surgery, Prosthodontics, and Survival. Implant Dent. 2009; 18:220-9.
21. Literature Review—Part I: Chemical, Physical, and Antibacterial Properties. J Endod 2010;36:16–27
22. Felippe MC, Felippe WT, Marques MM, Antoniazzi JH. The effect of renewal of calcium hydroxide paste on the apexification and periapical healing of teeth with incomplete root formation. Int Endod J 2005;38(7):436-42.