Apexification of Maxillary Central Incisor With an Open Apex & Apical Periodontitis – A Case Report

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Abstract – Achievement of a perfect apical seal using an inert filling material is the single most factor affecting success in endodontics. Trauma or caries exposure at the time of root development results in mature tooth with open apex. Various treatment modalities for closure of incompletely formed root apex are available till the time, of which, MTA has the most promising results. A clinical case involving tooth with open apex and apical periodontitis was treated using MTA. An apical plug of MTA was used before obturation with gutta-percha and sealer. At the 8 months follow-up, the tooth was free from symptoms and signs of bone healing were observed.
Keywords – root apex, blunder buss canal, apexification, mineral trioxide aggregate (MTA), immature tooth pulp necrosis.

Introduction

The root apex is of interest to endodontics because the stages of root development and the type of tissue present within the roots of teeth are significant to the practice of endodontics. The development of the root begins after the enamel and the dentin formation has reached the future cemento-enamel junction. At the time of tooth eruption root development is only 62-80% i.e., 2/3rd of the root is formed1. If due to trauma or caries exposure occurs, the pulp undergoes necrosis, dentin formation ceases and root growth is arrested. The resultant immature root will have an open apex which is also called as Blunder Buss Canal2. The major challenges associated with endodontic treatment of teeth with open apices are achieving complete debridement, canal disinfection and optimal sealing of the root canal system3. In the absence of a natural apical constriction, the production of mineralized tissue in the apical region is important to create an apical barrier and allow 3-dimensional adaptation of obturating material within the root canal system.

Apexification is a method of inducing apical closure through the formation of mineralized tissue in apical pulp region of a non vital tooth with incompletely formed root. The mineralized tissue can be osteodentin, osteocementum or bone or combination of all. Calcium hydroxide has been commonly used as an intracanal dressing to induce hard tissue deposition in necrotic teeth with open apices. The calcium hydroxide is renewed periodically until an apical barrier is formed4. The time needed to form an apical barrier is unpredictable and depends on the size of the apical foramen, the presence of infection and the host4,5. Mineral trioxide aggregate (MTA) is a powder consisting of fine hydrophilic particles that bind in the presence of moisture. Set MTA provides a good seal and excellent marginal adaptation6. In vivo studies have confirmed biocompatibility of this material and have shown a hard tissue inductive effect6,7. MTA can be used as an apical plug allowing for prompt obturation of the root canal8-10.

In this paper, MTA was used as a treatment modality for a clinical case of tooth with an open apex and associated apical periodontitis.

Case Report

A 19 year male patient with non contributary medical history was referred to the department of Conservative dentistry and Endodontics at Shree Bankey Bihari Dental College and Hospital, Ghaziabad, U.P. with the chief complaint of discolored upper front tooth. Clinical examination revealed a discolored maxillary right central incisor. Patient gave a history of trauma in the same region 12 years back. He underwent root canal treatment for the same 3 years back, however, the treatment was not completed. Radiographic examination revealed a blunder buss canal with 11 along with peri-apical pathology.

After administration of local anesthesia, a rubber dam was placed and an access cavity was prepared in tooth 11. The apical width of the canal was found to correspond to size #140 k-file (Dentsply Maillefer).

The canal was lightly instrumented using hand K-files (Dentsply Maillefer) at the working length. Because of the long time lapse of open apex and risk of bacterial infection, calcium hydroxide dressing was placed in the canal and the access cavity was temporarily sealed. After one week, in the second visit, the canal was irrigated with 2.5 % sodium hypochlorite and 17% EDTA. Endo Vac irrigation system (Sybron Endo) was used. After the final rinse with distilled water, the canal was dried using paper points and mineral trioxide aggregate was introduced into the canal using an amalgam carrier. It was condensed apically using hand pluggers to form MTA plug of 4-5 mm length. The position of the MTA plug was checked radiographically. Care was taken not to extrude MTA into periapical area.

A moist cotton was placed into the canal for 24 hours, as MTA requires moist condition for setting. Back filling of remaining canal was done with E & Q system (Meta Biomed Co. Ltd.) along with AH Plus sealer (Dentsply Maillefer). The access cavity was later restored with composite followed by prosthetic rehabilitation with a PFM crown. At the 8 months follow-up, signs of bone

healing were observed.

Discussion

The endodontic treatment of a non-vital immature anterior tooth after trauma remains complicated because of necrotic pulp tissue, large open apices, divergent root walls, thin dentinal walls and frequent periapical lesion. The main aim of root end filling material is to fill the apical canal space and obtain hermetic seal between periodontium and the root canal system12. Also while treating non-vital teeth, elimination of bacteria from the root canal system is jeopardised. As instruments cannot be used properly in teeth with open apices, cleaning and disinfection of the root canal system rely on the chemical action of NaOCl as an irrigant and calcium hydroxide as an intracanal dressing13. NaOCl is known to be toxic, especially in high concentrations. When rinsing immature teeth with open apices, there is an increased risk of pushing the irrigant beyond the apical foramen. Therefore, it is advisable to use less concentrated NaOCl, which is less toxic.

With the EndoVac system, irrigant is pulled into the canal and removed by negative pressure at working length. Also, more irrigant can be delivered through the delivery/evacuation tip. While the cannulas are in the canal, a constant flow of fresh irrigant is being delivered by negative pressure to working length, thereby increasing the efficacy of canal debridement14. Calcium hydroxide paste was used because of its antimicrobial activity and to prevent MTA extravasation into the periapical area. Different vehicles can be used depending on the length of time the dressing will remain in the canal. When the period was up to 2 weeks, saline was used as the vehicle15. A 17% EDTA rinse was carried out before placement of the intracanal dressing to remove the smear layer and facilitate diffusion of calcium hydroxide through the dentin and before obturation to ensure better removal of calcium hydroxide.Although calcium hydroxide has been shown to be a good material for treating immature teeth, long treatment time, the need for multiple appointments and several radiographs and possible canal infection as the crown is sealed with only temporary materials over a long period are some of its main disadvantages4,16,17. A recent prospective clinical study showed that the mean time necessary for the formation of an apical barrier with this technique is more than 12 months18. The barrier formed using calcium hydroxide for apexification may be porous and has sometimes even been found to contain small amounts of soft tissue19.

Because of MTA's excellent biological properties and ability to create a good seal, it was used for creating a barrier in the apical area of tooth with open apex, thus compressing treatment time to 1 or 2 visits20. Placement of the MTA plug facilitated obturation of the root canal without overextension of the filling material. MTA consists of fine hydrophilic particles that set in the presence of moisture in approximately 4 hours7. The final obturation was, thus, carried out at a subsequent visit to avoid dislocation of the MTA plug beyond the apex. A moist cotton pellet was left over the MTA to facilitate setting and backfilling was done to fill the canal the next day.

Follow-up radiographs showed osseous healing and, during clinical examination, the patient was asymptomatic. The results obtained with MTA seems to be similar to those of other studies10,21,22.

The choice of treatment regimen for teeth with open apices depends on the individual case and operator experience and familiarity with handling the various materials. Patient availability for follow-up appointments should be considered as well if multiple sessions are required.

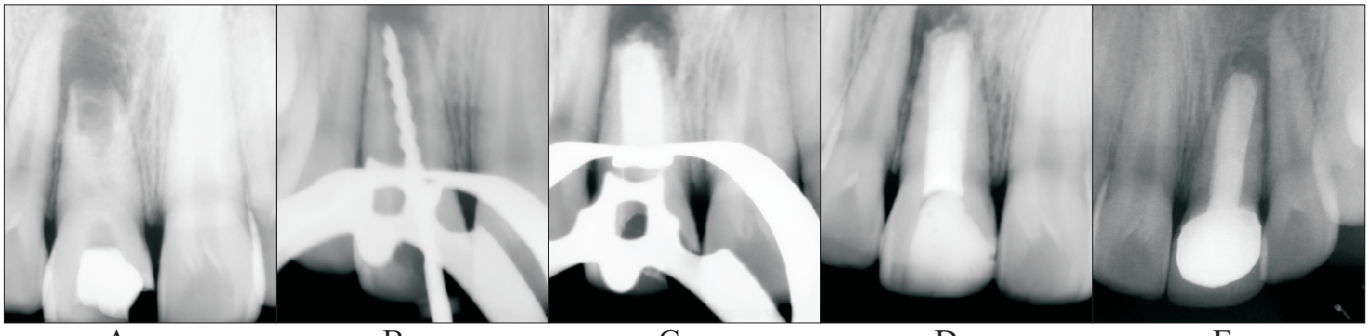
As an endodontist, we should be careful to adopt the best available evidence for supporting clinical treatment plans. Ignoring science for the sake of speed and simplicity may place the final outcome for our patients in jeopardy.

Conclusion

During the last 20 years there have been many changes in the rationale governing the treatment of teeth with open apex11. It is essential to have thorough understanding of the compatibility of the material, its physiological response, and the histological changes that takes place during and after the use of present available materials. Recent material like MTA is a promising material and plays important role in healing and sealing of root canal and thus saving patient from psychological trauma of surgical procedures.

Reference

References are available on request at editor@healtalkht.com



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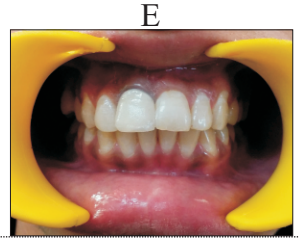

(A) Pre-operative radiograph reveals wide open apex with apical periodontitis.
(B) Radiograph showing canal wider than #140 K-file (Dentsply Maillefer).
(C) MTA plug formed at the apex.
(D) Radiograph taken after backfilling of the canal and post-obturation composite restoration.
(E) Follow-up radiograph taken after months shows signs of bone healing.