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MTA Obturation with Open Apices- A Case Series

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Abstract: *Mineral trioxide aggregate (MTA) has emerged as a reliable bioactive material with extended applications in endodontics that include the obturation of the root canal space. This case series demonstrates the dramatic healing of the periapical region with open apices of maxillary incisors. The root canal space was obturated with MTA in anticipation of the formation of artificial apical plugs. The treated teeth were asymptomatic, and radiographic findings demonstrated the periradicular regeneration of bone and apical closure after six months. MTA can be considered a very effective material to promote regeneration of apical tissue, even in teeth with large open apices.*

Keywords: *MTA, Apexification, Open apices.*

I. Introduction

Traumatic injuries to permanent teeth occur in 30% of children (1). The majority of these incidents occurs before root formation is complete and might result in pulp inflammation or necrosis (2). The main challenge in performing root-canal treatment in teeth with necrotic pulps and wide-open apices is to obtain an optimal apical seal. The wide foramen requires a large volume of filling material that may extrude from the root canal into the periapical tissues creating foreign-body responses and compromising the apical seal (3).

The obturation of the prepared radicular space has been achieved by using a wide variety of materials selected for their intrinsic properties and handling characteristics. These core materials have been classified as cements, pastes, plastics, or solids. Gutta-percha, in its various forms, has remained the paragon as a root canal filling material during the course of the last century (4). Mineral trioxide aggregate (MTA), a recently introduced cement, has variety of potential uses, including as a root canal obturating material. Studies have demonstrated encouraging regeneration of periradicular tissues, such as periodontal ligament, bone, and cementum, when MTA was used in endodontic procedures (5-6). It has superior biocompatibility and appropriate mechanical properties as it produces more dentinal bridging with superior structural integrity in a shorter time span with significantly lesser inflammation. MTA has been used for apexification of immature roots instead of Ca $(OH)_2$ because of its facilitation of normal periradicular architecture by inducing hard tissue barriers. MTA has also significant antimicrobial property on some of the facultative bacteria. It presented promising outcomes when used for the repair of lateral and furcation perforations. Formation of cementum surrounding MTA was observed, even after extrusion of MTA into a furcation (7-8). On the basis of these finding, MTA can be a suitable material for apical closure of mature root canals with open apices, which may impose technical challenges in obtaining adequate obturation because of apical perforation, over instrumentation, resorption, or former surgical treatment. Such nonsurgical treatment with MTA in difficult cases would be a good option and beneficial to patients.

The following case reports demonstrate the use of MTA as an oburating material to promote periapical healing of root canals with open apices.

II. Case Reports

Case 1:

A 20 year old male patient presented to Conservative department OPD with discolored 22. He had history of trauma in maxillary anterior teeth 10 year back. Clinical examination revealed periodontal pocket, pain on percussion, grade 1 mobility and no caries with #22. Radiographic examination demonstrated an apparent radiolucency at the periradicular area of the #22 (Fig 1). The patient was presented with various treatment plans, and he elected treatment that included MTA obturation. The consent was secured from the patient for the elected treatment plan. After anesthesia and rubber dam application the tooth #22 was accessed. Canal orifice enlarged with Gates-Glidden drills and root canal length was established by means of an

electronic apex locator and radiographs. The root canal was cleaned using size 60-90 stainless steel K-files, irrigation done using 5.25% NaOCl, and calcium hydroxide intracanal medication given after drying the canal by absorbent points. Patient returned after 7 days tooth was asymptomatic and canal was cleaned and irrigated. After drying the root canal was obturated with vertically compacted white MTA. The coronal MTA was dried and access cavity sealed with composite. Six month follow up radiograph showed osseous repair and apical closure (Fig 2).

Case 2:

A 15 year old female patient presented to Conservative department OPD with chief complaint of pain and swelling with #11 and #21. Clinical examination revealed discoloration, pain on percussion and grade 1 mobility with #11 and #21. Radiographic evaluation revealed open apices with periapical pathosis (Fig 3), and the case was diagnosed as an acute periapical abscess. The consent was secured from the patient for the elected treatment plan. After local anesthesia and rubber dam isolation, purulent exudate was discharged immediately after access opening. Chemomechanical instrumentation was completed by using size 60-90 stainless steel K-Files, 5.25 % NaOCl irrigation, and calcium hydroxide intracanal medication was given. The patient was prescribed antimicrobials and recalled after 7 days. Patient returned after 7 days tooth was asymptomatic and canal was cleaned and irrigated. After drying the root canal was obturated with vertically compacted white MTA. The coronal MTA was dried and access cavity sealed with composite. Six month follow up radiograph showed osseous repair and apical closure (Fig. 4)

III. Discussion

The most important problem in the classic apexifcation technique with calcium hydroxide is the duration of the therapy, which is from 3 to 21 months (9). The duration depends on factors such as size of the apical opening, the traumatic displacement of the tooth and the repositioning methods used. Calcium hydroxide creates an environment conducive to the formation of an apical barrier formed by osteo-cementum tissue at the end of the root canal in teeth with open apices (10,11). During apexification procedure the root canal is susceptible to reinfection because it is covered by a temporary seal. In addition, the canal is susceptible to fracture during treatment. A permanent treatment is preferable to limit reinfection that could cause apical periodontitis and inhibit canal closure. The importance of the coronal seal was shown by Tronstadet al. (12), which found the highest success rate in teeth diagnosed with good endodontics and good coronal restorations.

In these cases, the MTA powder is mixed as per the manufacturer's instructions (3:1 MTA: distilled water) to get a wet sand consistency. Mixture is placed in the root canal system under the surgical operative microscope with the help of PD messing gun. This technique allows an accurate placement of the mixture and a good adaptation of the material, which allows a tight seal of the root-canal system. The application of the MTA mixture must not be pushed at the end of the root canal. The operative microscopy allows one to see directly to the end of the root-canal system directly allowing for a good chance for accurate placement of the material. The clinical cases reported here demonstrate that when MTA is used as an obturating material in necrotic teeth with immature apices, the canal can be effectively sealed. Both clinical and radiography follow-ups in the reported two cases showed healing of the apical periodontitis and new hard tissue formation in the apical area of affected teeth. The results are similar to another clinical report (5), where MTA was used as an obturating material in central incisor with an open apex.

IV. Conclusion

In conclusion, MTA appeared to be a valid option to promote regeneration of apical tissue, even in infected fully developed teeth with open apices. Long-term outcome studies appear appropriate to test if this method is consistently successful over a large group of teeth.

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