Management of Non-Vital Teeth with Open Apices using MTA: Two Case Reports

***Karan Narang [1], Mohini Nayak [2], Abdul Wahed, [3] John V. George[4] and Sylvia Mathew[5]**

*Corresponding Author E-mail: wise.sudden45@gmail.com

Contributors:

[1,2,3]Post Graduate Students, [4]Senior Professor, [5]Professor and Head, Department of Conservative Dentistry and Endodontics, Faculty of Dental Sciences, M.S. Ramaiah University of Applied Sciences, Bangalore - 560054

Abstract

One of the treatment options for necrotic teeth with open apex is apexification, which is induction of apical closure to produce more favourable conditions for conventional root canal filling. The Conventional method of apexification with Calcium hydroxide has certain disadvantages such as long period of treatment, tooth fracture and an incomplete calcification. Mineral Trioxide Aggregate (MTA) as an apical sealing material has gained popularity as an alternative treatment for open apices. The report presents management of two upper anterior teeth with open apices using MTA and Thermoplasticized Gutta-Percha.

Keywords: *Apexification, Mineral Trioxide Aggregate, Tooth Apex*

1. INTRODUCTION

Treatment of necrotic teeth with open apices has so far been performed with the use of non-surgical endodontic procedures. Considering its limitations such as overfilling, lack of a specific treatment time and long duration of treatment, uncertain apical closure, weakness of cervical region of teeth, the use of apical plug method seems to be more practical[1].

Gerstein et al made use of Calcium hydroxide apical plug in teeth with open apices[2]. It was the material of choice to induce hard tissue formation at the apical end before placing the obturating material. However, calcium hydroxide apexification has certain limitations like the duration of time needed to form apical barrier, the number of dressings needed before the complete closure of apex, the possibility of infection in between the appointments and the lowered fracture resistance of the tooth[3].

Mineral trioxide aggregate MTA was developed at the Loma Linda University, California, USA, as a root- end filling material in surgical endodontic treatment. Over the years, further research has resulted in MTA being applied in various clinical situations in addition to its use as a suitable root-end filling material[4].

Mineral Trioxide Aggregate MTA has been proposed as a material suitable for one visit apexification, as it combines biocompatibility and a bacteriostatic action with favourable sealing ability when used to repair root/pulp chamber perforations or as a root-end filling material[5]. MTA offers a barrier at the end of the root canal apical plug in teeth with necrotic pulps and open apices that permits vertical condensation of warm Gutta-percha in the remainder of the canal[6].

During a histological study on dogs, Shabahang and Torabinejad found out that the amount of induced inflammation with hard tissue formation following root-end induction by MTA compared to that of Calcium Hydroxide and Osteogenic Proteine-1 do not differ appreciably, but the ability of MTA to induce hard tissue formation is considerably higher than the other two[7].

The aim of this report is to present the short-term follow-up results in nonvital teeth with open apices which were managed with an MTA apical plug technique followed by Thermoplasticized Gutta-percha obturation.

2. CASE REPORTS

Case 1

A 32-year-old female patient reported to the Department of Conservative Dentistry and Endodontics, Faculty of Dental Sciences, Bangalore with the complaint of pain and swelling in the upper anterior region and gave a history of initiation of root canal treatment for the upper anterior tooth. Patient also gave history of trauma nine years back. Clinical examination revealed discoloured and fractured maxillary right central incisor and lateral incisor. Intra Oral Periapical Radiograph revealed incompletely formed apex as well as thin dentinal walls in apical region in relation to the central incisor. Fig 1 Teeth elicited negative response on thermal as well as Electric Pulp Testing. Hence, diagnosis of Ellis class IV fracture leading to pulpal necrosis was made. Root canal treatment in the lateral incisor and apexification using MTA as an apical matrix followed by obturation with Thermoplasticized Gutta-percha was planned in maxillary central incisor.

After rubber dam application, endodontic access was modified in relation to 11 and 12.Radiograph was taken to confirm the working length of both the teeth. Fig 2 Gentle instrumentation was done with #80 K-file in a circumferential manner. Irrigation with 3% Sodium hypochlorite was done throughout the shaping and cleaning procedures. Canal was dried with multiple absorbent points and double Antibiotic Paste Metronidazole and Ciprofloxacin dressing was placed. Access was temporized with Zinc Polycarboxylate Cement.

The patient was recalled a week later. Following isolation the canal was thoroughly irrigated with saline to remove any remnants of double Antibiotic Paste followed by 17% liquid EDTA Smear Clear SybronEndo, CA, USA. After drying the canal, MTA Dentsply Tulsa powder was mixed with distilled water which was then carried into canal with the help of amalgam carrier and packed to form an apical plug of approximately 3 mm under operating microscope Fig 3.Over this a moist cotton pellet was placed and the access cavity was sealed. The following day, cotton pellet was removed, and canal was thoroughly dried with multiple absorbent points. Subsequently, backfill was performed using Thermoplasticized Gutta-percha Elements Obturation System, SybronEndo, CA, USA Fig 4. Maxillary right lateral incisor was obturated using cold lateral compaction with Gutta percha and AH Plus sealer. A 3-month follow-up radiograph revealed decrease in the size of apical radiolucency Fig 5.

Fig. 1 Intra oral periapical radiograph showing opex apex in relation to right maxillary central incisor

Fig. 2 Working length determination

Fig. 3 Mineral trioxide aggregate placed in the tooth

Fig. 4 11-Obturation and master cone

Fig. 5 Post obturation

Case 2

A 19-year-old female patient reported to the Department of Conservative Dentistry and Endodontics, Faculty of Dental Sciences, Bangalore, Karnataka, with the chief complaint of fractured upper anterior tooth. The patient gave a history of trauma four years back. Clinical examination revealed crown fracture of Maxillary left central incisor involving the enamel, dentin and pulp with minimal crown structure which appeared to be proclined. Hence, diagnosis of Ellis class IV fracture, Fig 6 leading to pulpal necrosis was made.

The tooth failed to respond to thermal as well as electric pulp test. Intra Oral Periapical radiograph revealed Central Incisor with open apex Fig 7. Root canal treatment using MTA as an apical plug followed by Cast metal post and core was planned to reinforce the tooth structure.

On the initial visit, access was prepared and working length determined. Cleaning and shaping was performed using circumferential filling up to #80 K-file Fig 8. The canal was irrigated with 3% of Sodium hypochlorite between each instrument use. Calcium hydroxide dressing was placed for the disinfection of root canal. Patient was recalled after 1-week. On the second visit, the Calcium hydroxide dressing was removed. An apical barrier of 3-4 mm was established using MTA. A moist cotton pellet was placed over the MTA and access cavity was sealed with IRM. Fig 9.

On the third visit, the setting of MTA was confirmed.

Post space was prepared in 21 using Peeso reamer. Impression of post space and Core build up was made by direct technique using Inlay Wax Type II.

The core angulation was oriented to align the tooth in relation to the adjacent central incisor.

The pattern was processed for casting using base metal. Provisional restoration was fabricated and luted using Non Eugenol cement.

The cast post was cemented using Glass Ionomer Cement.

Fig 10 Following tooth preparation final impression was made using Polyvinyl siloxane impression material and shade selection was done using Vita shade guide.

Porcelain fused to metal crown was then cemented using type I Glass Ionomer Cement Fig 11.

Fig. 6 Preoperative maxillary left central incisor

Fig. 7 Intra oral periapical radiograph

Fig. 8 Working length determination

Fig. 9 Mineral trioxide aggregate placed in the tooth

Fig. 10 Custom cast post and core

Fig. 11 Postoperative

3. DISCUSSIONS

The success in endodontics is dependent on obtaining a perfect seal at the apical region. The endodontic treatment of nonvital immature anterior teeth after trauma remains complicated because of necrotic pulp tissue, large open apices, divergent root walls, thin dentinal walls, and frequent periapical lesion[8].

Apexification is the process of creating a barrier with hard tissue at the root end. Although, calcium hydroxide was used most commonly for the process of apexification, the time duration is too long ranging from 12 to 24 months[9.] Moreover, the barrier formed by apexification using calcium hydroxide is considered to be incomplete having a Swiss cheese appearance and can allow apical micro leakage leading to reinfection[10]. To overcome these disadvantages of using calcium hydroxide as apical sealing material, a one visit apexification using MTA was introduced.

MTA as an apexification material forms a seal between the material and the tooth. During the maturation of MTA, there is formation of an apatite like interface which fills in the gap formed during the shrinkage phase and improves the fracture resistance of the root canal walls[11]. MTA has an alkaline pH and exhibits superior biocompatibility and cytotoxicity. MTA provides a favourable environment for the cementum deposition because of the presence of calcium and phosphorus ion which induces osteoblastic or cementoblastic activity and provides favourable environment for cementum deposition[12]. This novel procedure reduces the treatment time. Importance of this approach lies in thorough

cleaning of root canal followed by apical seal with material that favours regeneration.

The main aim of Post and core is to replace the lost tooth structure. Cast posts and cores have several advantages. They include preservation of the maximum tooth structure as the post is fabricated to fit the radicular space with a superior adaptation to the root canal[13]. The anti-rotational property is an additional advantage. In the second case report, a cast post and core was used to closely adapted to the remaining tooth structure as well as to change the angulation of the crown and bring it in alignment.

4. CONCLUSION

Managing a tooth with open apex with a biocompatible material MTA has the advantage of being a single visit procedure. The clinical case reported here demonstrates that when MTA is used as an apical plug in necrotic teeth with immature apices, the canal can be effectively sealed. Follow-up radiographs showed osseous healing and, during clinical examination, the patients were asymptomatic.

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