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Management OfTeeth With Open Apices Using MTA As Orthograde Filling Material – A Case Report.

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Abstract:
The success of root canal treatment depends on the proper diagnosis, chemomechanical preparation and three dimensional obturation, in order to prevent reinfection. Teeth with open apices, such as in immature teeth or those with apical root resorption are clinical cases with difficult immediate resolution. So the treatment for these immature apex teeth, will differ from routine. Major challenges associated with endodontic treatment of immature teeth with necrotic pulp, achieving complete debridement, canal disinfection and most important optimal sealing of the root canal system. 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 report highlights the protocols to be followed while treating open apex teeth. Thorough knowledge, skill and patience are required for the clinicians to do the orthogradeobturation of MTA.

KeyWords:*Apexification, Calcium hydroxide, Mineral Trioxide Aggregate, Open apex*

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I. Introduction

Ultimate goal of endodontics is to debride and obturate the canal three dimensionally as possible in order to prevent re-infection.(1) In teeth with incomplete root development caused by trauma, caries and other pulpal pathosis, the absence of natural constriction at the end of the root canal presents a challenge and makes control of filling materials difficult.(2) Owing to the lack of an apical constriction, an alternative to standard root canal treatment, apexification or root end closure has been advocated.(3) Many materials have been reported.

Calcium hydroxide has been the first choice of material for apexification(4) with repeated changes over the course of 5-20 months to induce the formation of calcific barrier.(5) Its efficiency has been demonstrated by many authors even in the presence of an apical lesion. The unpredictable and often lengthy course of this treatment modality presents challenges, including the vulnerability of the temporary coronal restoration to re-infection (6) and has several disadvantages such as variability of treatment time (average 12.9 months),(7) difficulty of the patients recall management, delay in the treatment and increase in the risk of tooth fracture after dressing with calcium hydroxide for extended periods.(8)

Mineral trioxide aggregate (MTA) was developed by Mahmoud Torabinejad at Loma Linda University in the year 1993. MTA has the advantage over calcium hydroxide that it can be done in a single visit procedure. Apexification using MTA has several advantages as it neither gets resorbed nor weakens the root canal dentin and also sets in wet environment. MTA helps in the formation of cementum and osteoid-like tissue because of its alkaline pH and release of calcium and phosphorus ion.(9) It combines biocompatibility and bacteriostatic action with favorable sealing ability which stimulates cell growth, adhesion and proliferation.(10)

The aim of this case report is to highlight the management of an open apex of a non-vital immature permanent tooth using MTA as the orthogradeobturation material.

II. Case Report

A 26 year old male patient came to Department of Conservative Dentistry and Endodontics, Panineeya dental college, Hyderabad, with a chief complaint of pain and discoloration of maxillary left central incisor. Patient gave history of pain which was dull, gnawing in nature and aggravates on mastication. The tooth had suffered a traumatic injury 10 years back.

On clinical examination there was Ellis class IV fracture in relation to tooth 21. Tooth showed tenderness on percussion but no response to vitality tests. Radiographic examination revealed the information about the incomplete root canal treatment with open apex (Fig 1). The patient was explained about the treatment plan and root canal therapy using MTA as obturating material was selected and informed consent was taken.

In the first appointment access refinement was done with the help of burs (Endo-Z, DentsplyMaillefer) and ultrasonic tips (Start X # 1, DentsplyMaillefer) under rubber dam isolation. Working length is determined i.e. 17 mm radiographically with the help of 50 K file (Dentsply M-Access) (Fig 2). Preparation of the canal is performed very lightly and with copious irrigation using 1% sodium hypochlorite (ModiSurgico Healthcare Pvt Ltd, Maharashtra, India), passively in the canal followed by rinsing with saline. Then the canal rinsed with 17% EDTA (PREVEST Den Pro) for 1 minute followed by 2% CHX rinse (Essential Dental Systems). Root canal was dried with paper points (DiadentPvt Ltd) and calcium hydroxide (ApexCal, IvoclarVivadent) dressing was placed for 1 week (Fig 3).

After 1 week, on the second appointment, calcium hydroxide dressing was removed by irrigating the canal with saline and canal was dried with paper points. Mineral trioxide aggregate (White MTA, Angelus) was mixed with provided liquid (Powder to Liquid ratio = 3:1) by the manufacturer and introduced inside the canal with a plastic filling instrument (Waldent PFI). Preselected pluggers (GDC) were used to gently condense MTA into the canal. Complete canal is obturated till the cemento-enamel junction with MTA by adding increment wise and by evaluating with proper radiographs (Fig 4). A moist cotton pellet was introduced inside the pulp chamber to hydrate the material. Temporary restoration was done to seal the cavity.

After 24 hours the patient was recalled and temporary restoration is removed. The pulp chamber was cleaned with saline to remove any remaining cotton fibers. Then etching is done with 37% phosphoric acid (DentoEtchPvt Ltd) for 15 seconds inside the pulp chamber followed by rinsing. Fifth generation bonding agent (3M ESPE) is applied and cured with curing light (IvoclarVivadent) for 20 seconds. Composite restoration (3M ESPE Filtek Z350 Xt) is done using incremental technique by curing with curing light for 20 seconds (Fig 5).

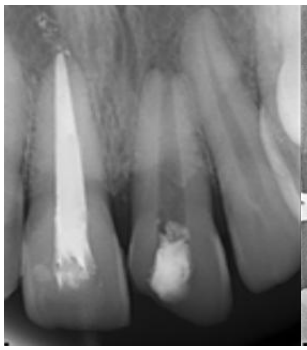

Fig 1: Pre-operative radiographirt 21

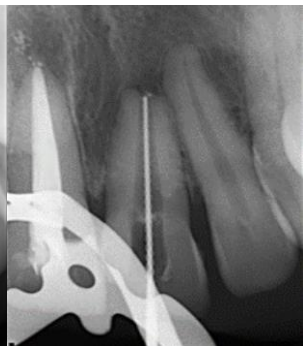

Fig 2: Working length determination irt 21

Fig 3: Calcium hydroxide dressing irt 21

Fig 4: Orthograde MTA obturation till CEJ irt 21

Fig 5: Composite restoration done irt 21 **Fig 6: 6 months follow up irt 21**

III. Discussion

The success in root canal treatment is dependent on obtaining a perfect seal at the apical portion. The endodontic treatment of non-vital 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. The main aim of root end material is to seal the apical portion of the canal and to obtain hermetic seal between periodontium and the root canal system.[11] When treating non-vital teeth, a main issue is eliminating bacteria from the root canal system. 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 dressing.[12]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.[13] In this case 1% NaOCl was used. A 17% EDTA rinse for 1 minute 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.[14]

For obturation, normally we need an apical barrier. It is achieved by apexification treatment, thus preventing the passage of toxins and bacteria into periapical tissues from root canal. Technically this barrier is necessary to allow compaction of root filling material.[15]Although calcium hydroxide has been shown to be a good material for treating immature teeth, various studies have revealed some disadvantages to using this material, such as 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.[16,17]

MTA has been widely recommended for plugging open apices.[18] As the crown root ratio is less, we decided to obturate the canal completely with MTA. It represents a primary monoblockin attempts to strengthen immature tooth roots. Although it does not bond to dentin, interaction of the released calcium and hydroxyl ions of MTA with a phosphate containing synthetic body fluid results in the formation of apatite-like interfacial deposits which fill up any gaps induced during the material shrinkage phase and improves the frictional resistance of MTA to the root canal walls.[19]These apatite deposits accounts for the seal of MTA in orthogradeobturations. MTA has superior biocompatibility and it is less cytotoxic due to its alkaline pH and presence of calcium and phosphate ions in its formulation results in capacity to attract blastic cells and promote favorable environment for cementum deposition.[20]Themajor advantage is that unlike calcium hydroxide MTA doesn't require long treatment duration, and it has less leakage and better antibacterial properties with setting time of 3-4 hours with a P^H of 12.5. MTA acts by producing interleukins and cytokines release which leads to the formation of hard tissue.[21,22]

The choice of treatment regimen for teeth withopen 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.

IV. Conclusion

MTA as orthograde filling material proves to be a better option for managingopen apices especially with short roots. It is an innovative procedure which is predictable and less time consuming one. MTA has an advantage of proper apical seal and excellent biocompatibility with favorable and promising results compared to calcium hydroxide.

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