ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/IJISRT24OCT1930

Management of Maxillary Anterior Tooth with Open Apex by MTA Apexification

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Abstract:- Endodontic therapy of teeth with open apex and chronic periapical lesion presents a challenging situation to the clinician. The present case reported outlines treatment of symptomatic maxillary central incisors that have a traumatic history of 15years. The radiographic assessment indicated an underdeveloped apex & chronic periapical lesion. Irrigants, including 3% sodium hypochlorite & 17% EDTA, utilized with ultrasonic activation. Calcium hydroxide utilized as an intracanal medication. Apexification was performed with MTA, then residual canal filled with thermoplasticized gutta-percha. A one-year follow-up revealed nearly complete resolution of the periapical lesion. Thus, central incisor with a chronic periapical lesion and open apex responded well with apexification procedure with MTA (Mineral trioxide aggregate).

Keywords:- *Apexification, Calcium Hydroxide, Immature Teeth, MTA, Open Apex.*

I. INTRODUCTION

Development of dentinal walls & root apices may be impeded by pulpal inflammation or necrosis caused by trauma to immature permanent teeth (1). Under these circumstances, it is particularly challenging to construct an apical barrier with 3-dimensional seal, especially if condition is diagnosed later. Management of these teeth becomes even more complex when a periapical infection is also present. Greater width at apical portion, lacking apical constriction, & thin dentinal walls characteristics of an open apex tooth(2). It is possible to encounter difficulties with working length determination and extrusion of irrigating or obturating materials during the management of these open apex cases(3). A proper apical barrier is required to facilitate condensation of root canal material to ensure a sufficient apical seal.

The treatment options for teeth with immature apex include apexification and regeneration. Pulp regeneration is an advantageous therapeutic approach in these instances, facilitating additional root development while strengthening dentinal walls. However, it's usually confined to individuals aged 8&16years(4). Apexification is a better treatment approach in adult patients with chronically infected apex. The objective of apexification procedure is to repair apex through developing a hard tissue barrier at apex. Traditionally, calcium hydroxide mixture is used to induce a calcified barrier. Completion of the calcified apical barrier formation is typically a protracted process, necessitating 6-24months of treatment duration (2). The duration of this method has disadvantages including the possibility of tooth fracture from extended CaOH2 use and with root canal re-infection(5). Thus, Single-visit apexification is advised for teeth with open apex management. MTA is an alternative material to traditional calcium hydroxide for apexification procedure. MTA is a biomaterial that performs exceptionally well when sealed in hydrophilic conditions with an excellent biocompatibility which makes it a right choice for an apical plug(6). With a one-year follow-up, current case report describes application of MTA for treating tooth with an open apex & chronic periapical lesion.

II. CASE REPORT

The chief complaint of a male patient, age 26, that arrived to department was pain in region of his upper anterior tooth for past week. Patient experienced trauma fifteen years ago. Patient had no major medical history. Upon intraoral examination, Ellis class-II fractures irt11&21 identified. Tenderness of percussion was also noticed. Tooth 21 elicited immediate lingering response on thermal and electrical pulp testing which lasted for more than a minute.

Fig 1: Preoperative Photograph

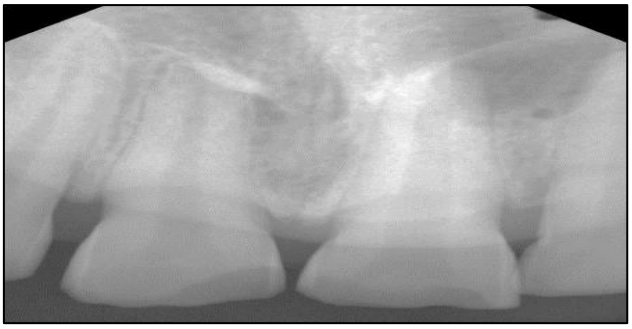

Fig 2: Preoperative Radiograph

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Tooth 11 had no response on thermal and electrical pulp testing. Periapical radiograph of tooth 21 showed an incompletely formed apex & periapical radiolucency measuring about 3×3mm and periapical widening has been reported irt 11. Based on all clinical and radiographic results diagnosed as symptomatic apical periodontitis case, it was decided of performing root canal treatment of 11 and apexification irt 21.

Access preparation was done in relation to 11 & 21 under rubber dam isolation & root canal orifice has been located. Working length determination was done on both the tooth and minimal instrumentation was done for 21 using hand instruments up to 80K file size. A step-back preparation was done on 11. 3% sodium hypochlorite & normal saline employed for root canals irrigation. Care was taken during irrigation to prevent extrusion of irrigant since the tooth had an open apex. Both canals received calcium hydroxide intracanal medication for two weeks, along with following visit, cold lateral condensation employed to obturate canal11. Subsequently, after two dressing of calcium hydroxide 21 was completely asymptomatic. Calcium hydroxide was removed from the canals mechanically. Passive ultrasonic irrigation was performed using a smaller size file and sodium hypochlorite. Root canal was dried using paper points.

Fig 3: Under Rubber Dam Isolation

Fig 4: Working Length Determination

Fig 5: MTA Apical Plug

MTA was mixed in a ratio of 3:1 (powder: liquid ratio) till a sandy consistency is reached. It has been carried to canal employing MTA carrier. MTA was condensed at the periapex using hand plugger. Condensation was done carefully to avoid apical extrusion. A 5mm of MTA apical plug was confirmed using radiograph. A damp sterile cotton pellet positioned over canal orifice, & temporary restoration employed for seal access cavity. After one-day temporary filling removed & setting of MTA has been confirmed. Remaining canal backfilled using thermoplasticized gutta-percha & AH plus sealer employing vertical compaction. Post-endodontic filling was given irt 11 and 21 using composite resin with a glass ionomer cement as orifice barrier which provides a reinforcement at cervical region of tooth.

Periradicular healing was reviewed one year later. Patient was asymptomatic & periapical radiograph revealed lesion healing.

Fig 6: Post Endodontic Restoration

Fig 7: Post Operative Image

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Fig 8: Review After One Year

III. DISCUSSION

Pulpal necrosis and inadequate development of root apices are major consequences associated with traumatic dental injuries. A long-standing periapical infection of the tooth makes the management further complicated. Such tooth treatments include apexification & revascularization. Apexification is performed to prevent bacteria & toxins from entering periapical tissues from root canal as well as form a mineralized apical barrier (7). This barrier must also permit compaction of root-fill. In contrast to calcium hydroxide apexification, that necessitates multiple visits, MTA apexification requires fewer appointments. MTA may stimulate formation of cementum-like hard tissue adjacent periradicular tissue(8).

The main challenges in this case were the presence of the chronic periapical lesion and presence of open apex. Between appointments, bacteria that are resistant to root canal instrumentation may colonize canal. An effective irrigation protocols and the use of intracanal medicament plays a significant role in disinfection. Calcium hydroxide and antibiotic pastes are agents used as intracanal medicament. Intracanal medicament employed was the calcium hydroxide. The use of calcium hydroxide can effectively eliminate microorganisms and the concerns regarding antibiotic sensitivity is absent for calcium hydroxide. Calcium hydroxide dissociates in calcium & hydroxyl ions, inhibiting bacterial metabolism and enzymatic activity(9). Calcium hydroxide was given until patient was asymptomatic. The use of stringent irrigation protocols with ultrasonic activation of irrigants also helps in an effective microbial elimination(10).

Obturation technique employed was vertical compaction using thermoplasticized gutta-percha. Unlike lateral condensation, it improves seal & avoids compaction stresses on thin dentinal walls.

Follow-up after one year showed satisfactory healing of periapical lesion radiographically.

IV. CONCLUSION

MTA apexification of necrotic maxillary central incisor with open apex was successful clinically & radiographically. The healing of chronic periapical lesions aided by administration of calcium hydroxide as an intracanal medication along with strict irrigation procedures.

ACKNOWLEDGMENT

We would like to acknowledge the guidance and support provided by faculty of Department of Conservative Dentistry & Endodontics, whose expertise in endodontic techniques and materials proved invaluable in the successful management of this case. We are grateful to the patient for their cooperation and follow-up commitment, which was essential for achieving a successful treatment outcome.

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