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Case Report

A Case Report on Comparison of Mineral Trioxide Aggregate and Biodentine for Management of Open Apex in Permanent Immature Anterior Teeth

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Abstract

Open apices are considered to be the most challenging cases in endodontics. The rationale of this case report was to observe the effect of MTA and biodentine on root end formation in the same patient. Mineral trioxide aggregate (MTA) and biodentine were used for formation of apical plug followed by further obturation with gutta percha. It was reported that the initial root end formation was better in the case where MTA was used as apical plug material as compared to Biodentine.

Keywords: apices, endodontics, Mineral trioxide, MTA, percha, obturation.

INTRODUCTION

Open apices are most common sequel after traumatic injury. Management of an open apex is a constant challenge as the divergent walls and wide open apex makes chemo-mechanical preparation and obturation difficult and it also requires formation of an apical matrix against which successful endodontic treatment can be performed [1]. Apexification is a viable option for management of open apex. It is defined as a method to induce a calcified barrier in a root with an open apex or continued apical development of an incompletely formed root in teeth with necrotic pulp tissue. Apexification or bridge formation results in apical root closure of such open apices cases [2]. Several materials have been formulated and used for apical plug formation. Calcium hydroxide was once considered as gold standard for apexification [3]. Since the advent of mineral trioxide aggregate (MTA), it has been the material of choice and gold standard for apexification. It's physical and chemical properties such as biocompatibility, sealing ability, cementogenesis, and several other advantages make it a landmark in the history of endodontics. However, some disadvantages include long setting time, poor handling characteristics, high cost [4-8]. Biodentine, a calcium silicate ($CaSiO_4$) material is a novel material introduced in market by Septodent in 2009 to overcome the disadvantages of MTA and is considered as bioactive dentine substitute. Biodentine offers better consistency and handling properties. The quicker setting time of Biodentine (9-12 min) is an advantage as obturation can be performed after it is set on the same appointment [5]. This case report describes successful management of traumatized permanent anterior teeth with open apex with MTA and Biodentine apexification followed by root canal treatment and full crown restoration, where MTA and Biodentine were compared for their root end formation property.

CASE REPORT

A 30 years old male patient reported to Department of Conservative dentistry and Endodontics, Vyas Dental College and Hospital with chief complain of fracture in upper anterior teeth. The medical history was not contributory. Patient gives history of trauma 5 year ago. On clinical examination complicated crown fracture was seen with respect to 11 and 21. No tenderness on percussion and mobility was noted with respect to 11 and 21. An intraoral radiograph was taken and wide open apices were seen with 11 and 21 with no periapical radiolucency (Figure-1). On clinical and radio graphical evaluation a diagnosis of traumatized

teeth was made with permanent immature apices with 11, 21. Apexification was planned as a treatment option and patient consent was taken.

Fig-1: Pre-operative radiograph of 11 and 21

An endodontic access cavity preparation was established using Endo-Z bur and the working length was established radio-graphically 1mm short of the radiographic apex and reference point was recorded (Figure-2). The canal was gently instrumented to 80 K file and copius irrigation was performed using 3% ml of sodium hypochlorite and normal saline using side vented irrigation needle. After cleaning and shaping, calcium hydroxide intracanal medicament was given for one week and access cavity was temporized with cavit.

Fig-2: Working Length determination

On recall visit, the interim restoration was removed and copious irrigation and circumferential filing was done to remove calcium hydroxide from the canal. The canal was completely dried with size 80 absorbent paper point [Ultradent Products Inc., USA]. Suitable pluggers were selected to condense MTA and biodentine. MTA [MTA ProRoot, Dentsply, Tulsa, OK, USA]) was mixed with distilled water to a consistency of wet sand and placed in increments in the apical region of the canal. MTA was condensed with light pressure using prefitted hand pluggers until 5mm of apical plug was made with MTA in relation to tooth no 21 and after that wet sterile cotton was placed in the remaining canal above MTA. The tooth was then given a temporary restoration with cavit (Figure-3).

Fig-3: Showing 5mm apical plug of MTA with respect to 21

Biodentine (Septodont, St. Maur-des-Fossés, France) capsule was tapped on a hard surface to diffuse the powder. After this, five drops of manufacturer's supplied liquid was dispensed into the capsule. The capsule was then placed in triturator for 30 second. After mixing, biodentine was placed at the apical region until 5 mm apical plug was made in relation to tooth no. 11 (Figure-4).

Fig-4: Showing 5mm apical plug of Biodentine with respect to 11

On next appointment the whole canal of 11 and 21 was obturated using gutta percha and post-endodontic access cavity was sealed with composite (Filtek Z 250 XT (3M ESPE, St. Paul, MN, USA) (Figure-5). The patient was kept under examination and follow up radiographs was carried out at 3 and 6 months respectively (Figure-6).

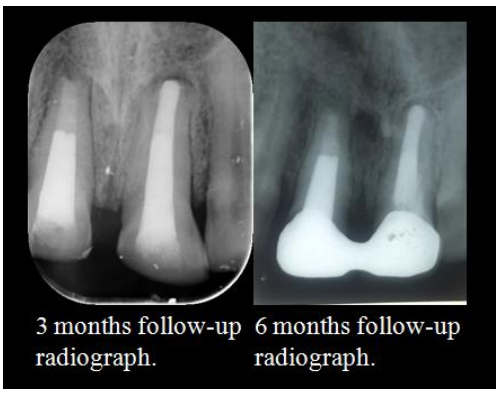

Fig-5: Obturated root canal with respect to 11 and 21

Fig-6: Showing 3 and 6 months follow -up radiograph

DISCUSSION

Literature suggests that the objective of apexification is to attain an apical barrier in root end formation which then helps in prevention of the passage of toxins and bacteria into periapical tissues from the infected root canal.[2] Prime principal of this apical plug is to achieve a proper sustainable barrier for compaction of root filling material against it. The rationale behind this case report is the comparison of MTA and biodentine in the same patient as the host's ability to resist an infection is same. Trauma to the tooth might result in clinical or radiographic manifestations, pulpal changes, periradicular inflammation and incomplete development of root apices. Blunderbuss canals cause an intimidation to an endodontist as the presence of thin dentinal walls is more susceptible to fracture [2, 6]. Earlier Calcium hydroxide was once considered as gold standard for apexification because of its efficacy to induce the formation of apical mineralized barrier in root end formation, but it has some disadvantages likes it required multiple visits and makes tooth more brittle due to its protelytic and hygroscopic properties and the apical plug which is formed by calcium hydroxide is porous and non continuous [3]. MTA has become the material of choice for apexification by. The composition of MTA contains CaSiO, bismuth oxide, calcium carbonate (CaCO), calcium sulfate, calcium aluminate. It contains a hydrophilic powder that reacts with water and produces a calcium hydroxide and CaSiO hydrated gel [9-14]. Holland et al. in a study theorized that the tricalcium oxide in MTA reacts with tissue fluids and forms calcium hydroxide, which results in an apical barrier [15]. Its use for apexification was first reported in 1996 [16]. Shabahang *et al*., in 1997 in a study on dogs compared MTA, osteogenic protein-1 and calcium hydroxide for apexification and found that MTA has maximum ability to form apical barrier [17]. Simon *et al*., in 2007 conducted a study and used MTA on 57 teeth and reported that MTA had showed successful results in one-visit apexification treatment. He concluded that that use of MTA reduces root fracture risk, had better patient compliance and showed early results [18]. Biodentine is a bioactive dentin substitute. The powder composed of tricalcium silicate with added $CaCO_3$ and zirconium oxide. The liquid portion contains calcium chloride ($CaCl_2$), as setting accelerator, in the water reducing agent. $CaCl_2$ addition decreases setting time and also improves its handling properties. Biodentine cannot be used in the presence of moisture unlike MTA, hence it is considered the limitation of this material [19]. In the current case report MTA and Biodentine were used for apexification and it was concluded after 6 month follow-up that MTA has better results in apexification cases as compared to Biodentine. The probable reason for this could be that MTA has superior marginal adaptation. Multiple studies have reported that MTA forms complete seal due to the interaction of calcium and phosphate ions which facilitates the apatite crystal formation at material dentin interface hence prevents bacterial leakage. Superior marginal adaptation of MTA over biodentine can influence the clinical success [20, 21].

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