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Management of Two adjacent Maxillary Central Incisor with open apices and periapical lesion with MTA and Biodentine: A two year radiographic follow up Case Report

[1]Dr.Satish Sane, MDS Senior Lecturer, Department of Conservative Dentistry and Endodontics ,G.D Pol Foundation Y.M.T Dental College, Kharghar, Navi Mumbai.

[2]Dr.Pratik Chandrakant Malusare, MDS Senior Lecturer, Oral medicine & Radiology Department ,G.D Pol Foundation Y.M.T Dental College, Kharghar, Navi Mumbai.

[3]Dr.Neha Khalap, Private practice, Mumbai, Maharashtra.

[4]Dr.Harshraj Gawande, MDS Senior Lecturer, Department of Conservative Dentistry and Endodontics ,G.D Pol Foundation Y.M.T Dental College, Kharghar, Navi Mumbai.

Corresponding Author: Dr.Satish Sane, MDS, Senior Lecturer, Department of Conservative Dentistry and Endodontics, G.D Pol Foundation Y.M.T Dental College, Kharghar, Navi Mumbai.

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Abstract

Management of open apex stand in need of different protocol of endodontic therapy than conventional endodontics. One step Apexification forms indispensable modality for the same. It involves formation of favorable calcific barrier at the apical portion of the root. Various root end filling materials like calcium hydroxide, Calcium Phosphate, Bone Morphogenic Protein, MTA(Mineral Trioxide aggreagate) and Biodentine have been used for apexification. This case reports describes the management of open apices in two adjacent maxillary central incisior with MTA and Biodentine and its two year radiographic follow up.

Keywords: Apexification , Mineral Trioxide Aggregate, Biodentine, Open apex

Key message: Single visit apexification is an effective and predictable treatment modality for management of non vital young permanent teeth. Calcium silicate based materials are preferred choice for apexification. These materials promote healing and achieve favourable end results.

Introduction

Management of young permanent tooth possesses a clinical challenge to a dentist. Trauma to young permanent tooth often leads to pulp necrosis.[1] Apexification becomes one of the treatment modality in such cases.[2] Various materials like calcium hydroxide, dentine chips, bone morphogenic protein,hyrdoxyapaptite have been used in past.[2] Conventional material, calcium hydroxide required long treatment time, need for multiple visit, patient cooperation, decreased fracture

resistance and loss of temporary restoration leading to possibility of reinfection. Use of calcium silicate based materials like MTA and Biodentine eliminates above disadvantage and provides faster setting, with excellent seal and tissue healing. The following case report is an effort to assess the effectiveness of MTA (ANGELUS) and Biodentine (Septodont) in a patient with open apices in the maxillary central incisors.

Case History

A young 19 year old female with history of dental trauma 11 years ago was referred to Department of Conservative Dentistry for complaint of fractured upper front teeth. She had undergone root canal treatment of both upper lateral incisor and incomplete access opening of two maxillary central incisor 10 days ago. Clinical examination revealed discoloured maxillary anteriors with Ellis class 3 fracture. All other clinical features were within normal physiologic limits. Radiographic examination revealed oblique fracture in crown involving pulp with 11 and 21(Figure 1). Root apex of both central incisiors were open and surrounded by 2*2 mm periapical radiolucency. Lateral incisors had radioopaque root canal filling with small periapical radiolucency.

Single visit apexification with MTA and Biodentine followed by fibre post was planned for 11, 21 respectively. Post patients consent, 1.8 ml of 2% Lignocaine containing 1:200,000 adrenaline was administered and Access opening was refined under rubber dam. Working length was established 2 mm short and canals were minimally instrumented under diluted sodium hypochlorite irrigant with 50# to 80# K file circumferentially. Intracanal calcium hydroxide was placed and access sealed with intermediate restorative material and patient recalled after 1 week. Repeat calcium hydroxide was placed till canal was absolutely dry with no signs of exudate. After 3 months, access was regained to visualize no signs of bleeding or exudate. Canals were irrigated with 2% chlorhexidine and dried with absorbent paper points. MTA was dispensed and mixed according to the manufacturer's instruction and placed in increments in the apical region of 11 using Map(micro apical placement) system. MTA was condensed with light pressure using prefitted hand pluggers and packed to form an apical plug of approximately 5 mm. A moist cotton pellet was placed over the barrier and the access cavity was sealed. Biodentine was mixed according to manufacturer's instructions and inserted in increments in apical part of 21 with MAP system. Similarly apical plug of 5mm was achieved with pluggers under light pressure and cotton pellet was placed and access sealed by IRM. A radiograph was taken to confirm the thickness of the apical barrier(Figure 2). After 24 hours access was regained and teeth were prepared for post and core. Size 2 Angelus Exacto translucent fibre post were selected .Both Teeth and Post were etched with phosphoric acid for 15 seconds and rinsed with water and dried. Prime and Bond NT (Dentsply) self- cure activator was coated in the canal and applied on the etched crown surface of 11 and 21 and the post and left to dry for 5 seconds. Calibra resin cement (Dentsply) was mixed and spread uniformly on post surface and on the canal wall. Post were then cemented in both canals and light cured for 20 seconds. 3M Filtek Z 350 was used as a core build up composite. Follow up was done after 6 months (Figure 3) and 2 years(Figure 4) for clinical and radiographic evaluation. Subsequently, once satisfactory radhiographic evidence of periapical bone healing was observed then patient was appointed for crown placement.

Discussion

The rationale of this case report is to assess the outcome of MTA and Biodentine used for apexification in the same patient so that host's ability to resist the infection is the same, thus allowing to compare biological activity of both the materials. Traumatic injury to young immature tooth causes pulpal and periapical inflammation leading to interrupted development of root apex. Various treatment modalities are available from apexogenesis , apexification to revascularization for such cases. With long follow ups and need for patient cooperation required for other treatments hence single visit apexification was considered as preferred alternative. The ultimate goal of single visit apexification is to establish an apical stop with biocompatible material that would enable the canal to be filled immediately. [3] Literature suggest use of calcium silicate based

materials like MTA and Biodentine for single visit apexification.[3]

MTA is a bioactive cement consisting of powder of calcium silicate, bismuth oxide, calcium carbonate and calcium aluminate, that reacts with water to produce calcium hydroxide(CH) and calcium silicate hydrated gel.[4] In presence of biological substrate, MTA induces cell proliferation that helps in formation of new Periodontal ligament and cementum also alkaline pH makes microbes inhabitable.[5] Torabinejad et.al in 1999 compared osteogenic activity between MTA and Calcium Hydroxide. It was concluded that MTA produces significantly denser apical hard tissue formation than Calcium Hydroxide.[6]

Biodentine is a novel bioactive cement available in powder and liquid form. It consists of powder of tricalcium silicate, dicalcium silicate, calcium carbonate, calcium oxide, zirconium oxide, and calcium hydroxide. The liquid consists of a water-soluble polymer and calcium chloride, which accelerates the setting reaction.[7] Biodentine has an advantage of shorter initial setting span of 12 minutes, as compared to MTA, which is 2 hours 45 minutes. Literature has plethora of evidence in use of biodentine for variety of procedures ranging from pulp capping to perforation repair and apexification to retrograde root end filling. [7]

Biocompatible cements like MTA and Biodentine stimulates osteoblastic differentiation of human mesenchymal stem cells.[8] The calcium ions and presence of Si-OH groups of calcium silicate cements induce apical sealing through the deposition of apatite onto the surface of the root cement.[9,10] Superior sealing ability of these materials prevent entry of any toxins and microorganism beyond apex thus ensuring healing of periapical lesion.

Fiber post and core build was done in the case for retention of core composite with the tooth, also tooth had sufficient core ferrule. Crown placement was delayed till satisfactory evidence of periapical healing. Patient was asymptomatic during the follow up period. Radiographic evaluation was done, based on reduction in the size of periapical radiolucency, formation of calcific barrier and closure of open apex.

At the end of 6 month follow up, satisfactory healing of periapical lesion, calcific barrier formation and root end closure was evident in case of both 11 and 21. More Trabecular formation and increase in density was noticed post 24 month follow up. In the present case both MTA and Biodentine showed uneventful healing of periapical lesion and clinical success in longer time frame of follow up.

Conclusion

MTA and Biodentine are bioactive materials and successfully used for root end closure of open apices. Within the limitation of this study, Biodentine can be considered as a possible alternative to the MTA due to decreased setting time and easy handling characteristic. However, further clinical studies with larger sample sizes and longer follow-up periods are required to find the best apical barrier material in dental practice.

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Legend Figure

Figure 1

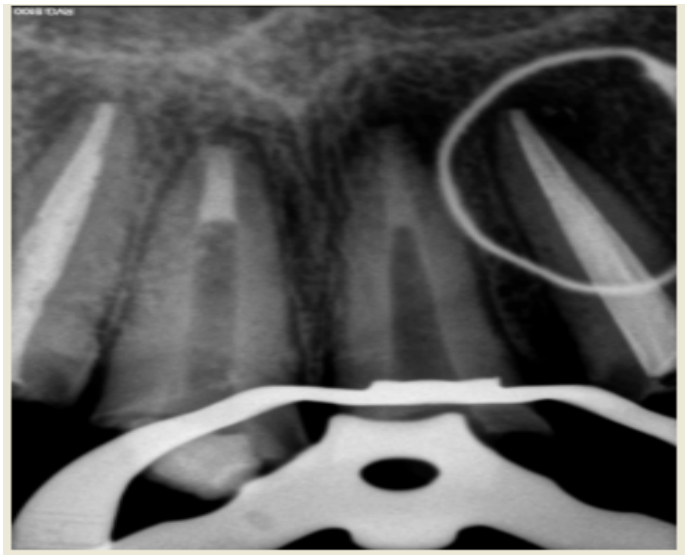

Figure 2

Figure 3

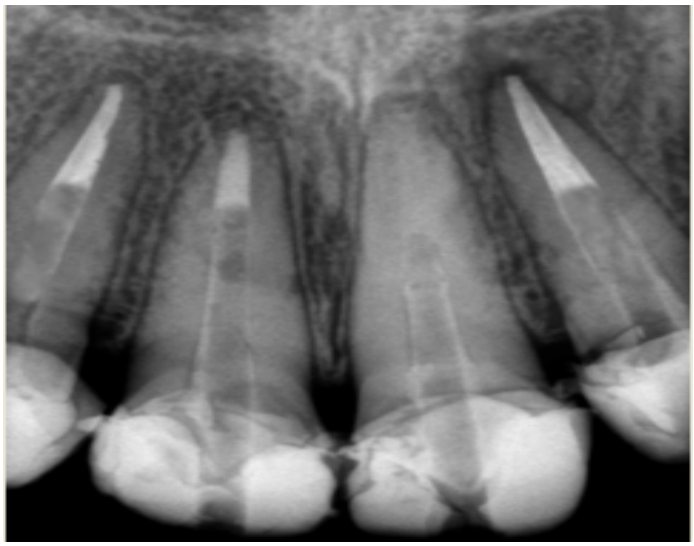

Figure 4