Case Report

International Journal of Dental and Health Sciences
Volume 03, Issue 05

MANAGEMENT OF OPEN APEX IN PERMANANT INCISOR WITH BIODENTIN: A CASE REPORT

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ABSTRACT:

Apexification is the treatment provided for management of non vital teeth with immature root. It involves formation of calcific barrier in the apical region of the root. The apical barrier created will aid in a favorable condition for conventional root canal procedure. Various root end filling materials such as calcium hydroxide, MTA, dentin chips, calcium phosphate ceramic and bone morphogenic protein are used for apexification. The duration and success of treatment depends on the material of choice. This case report presents a management of 10 year old boy with nonvital immature root associated with periapical lesion. Biodentine, a biocompatible material was used to create the apical barrier. At end of 24 months, the success in usage of biodentine as a material for apexification was evaluated by clinical and radiographic methods.

Keywords: Immature root, Apical barrier, Dentin substitute.

INTRODUCTION

In clinical practice, management of young permanent immature tooth is a challenge faced by the dentist.[1] Dental trauma involving the young permanent tooth may damage the apical neurovascular bundle and cause pulp necrosis.[2] This pulp necrosis leads to arresting of root formation resulting in improper closure of the apex.[3] In south india, the prevalence of traumatic dental injury to anterior teeth in adolescent is 14.85%.[4] The commonly affected tooth during traumatic injuries are the maxillary incisors.[5] In immature root apex, once the tooth becomes non vital apexification is a treatment of choice to obtain a superior seal.[6] Apexification is defined as method to induce a calcified barrier in a root with an open apex or the continued apical development of an incomplete root in teeth with necrotic pulp.[7] Calcium hydroxide paste was the material of choice to induce apexification.[8] Calcium hydroxide used for apexification had several disadvantage namely difficulty in patient follow up and possibility of increased tooth fracture.[9] To overcome these disadvantages, MTA was indicated as an alternative to calcium hydroxide. [10] MTA had superior biocompatibility and less cytotoxic compared to calcium hydroxide. MTA has prolonged setting time leading to two stage apexification procedure. [11] Biodentine is a similar material to MTA having superior

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characteristics due to presence of calcium chloride. This calcium chloride acts as an accelerator aids in faster setting time enhancing to perform single sitting apexification procedure.[12] Hence the aim of this case report was to present the use of Biodentine as an apexification material for immature root with 2 years follows up.

CASE DETAIL

A 10 year old boy reported with a chief complaint of fracture in his upper front tooth region. Patient had a fall six months back resulting in coronal fracture of an upper tooth. On clinical examination, there was an oblique fracture in the maxillary left incisor close to the pulp with mild discoloration. The patient had pain during intake of cold foods and mastication. Pain was present on palpation using digital pressure on the apical region of the fracture tooth. There was tenderness on percussion and no associated sinus opening adjacent to the involved tooth. Medical history was noncontributory. Intra oral periapical radiograph revealed presence of fracture involving pulp with open apex and periapical radiolucency in left upper central incisor (Fig. 1). On complete clinical and radiographic examination, upper left central incisor was diagnosed as non-vital tooth with open apex. Access opening was prepared using no 330 pear shaped bur and cavity was refined using Ex-24 safe end bur. The canal patency was attained using ISO 25 size K-file. The working length was determined by radiographic method using ISO 40 size H file (Fig. 2). The infected debris inside then canal was removed using ISO 50 size K file. Two percentage chlorhexidine and saline was used as irrigation to disinfect the canal. Triple antibiotic paste was placed inside the canal for one week as intracanal medication. After one week the intracanal medication was removed using saline. Absorbent paper 40 size 6% Dia-pro paper points was used to dry the canals. Biodentine is available in the form of capsulated powder and liquid twist cap bottle. The capsule was tapped and opened followed by addition of five drops of liquid. The capsule is closed and placed in an amalgamator for 30 seconds. The material once mixed attains a creamy consistency and can be manipulated. The material was carried inside the canal using amalgam carrier. A root canal plugger ISO size 100 was used to condense the material in an incremental manner. The condensation is done to form a plug of adequate thickness (>4mm) in the apical region. Radiograph was taken to confirm the thickness of apical barrier (Fig. 3). Once the material is set (approximately 12 minutes) the remaining canal space was obturated with gutta-percha using lateral condensation technique (Fig. 4). The coronal seal and fractured crown structure was restored using a tooth colored restorative material. Clinical and radiographic evaluation was done at 12 and 24 months intervals to review the healing and success of apexification treatment (Fig. 5, 6).

DISCUSSION

Traumatic injury of young permanent teeth can lead to lose of vitality resulting immature root formation.[13] Tooth with

open apex has variation in treatment protocol compared to conventional root canal treatment.[14] Apexification is a procedure of apical barrier formation through creation of hard mineralized tissue having a fairly predictable outcome.[15] After assess opening the canals were prepared using ISO 50 size K file to remove only the debris and to ensure less root canal preparation. Sodium hypochlorite was not used as an irrigant because it's virtually impossible to control the apical extrusion in a tooth with open apex.[16] Sodium hypochlorite was avoided because the apical extrusion will lead to chemical burn resulting in localized or extensive tissue necrosis.[17] Chlorhexidine 2% was used as a primary irrigant due to its increased antimicrobial substantivity.[18] Chlorhexidine had wide range of antimicrobial activity against both Gram positive, Gram negative bacteria.[19] After copious irrigation, the canal was dried using absorbent paper point to facilitate the coating of root walls using triple antibiotic paste. Triple antibiotic paste is a mixture of ciprofloxacin, metronidazol and minocycline.[20] This paste was very effective against E. faecalis and considered as a more powerful root canal medicament compared to calcium hydroxide paste.[21] Traditionally, the most commonly used material for apexification is calcium hydroxide. In calcium hydroxide apexification, there is a formation of mineralized tissue by cells of the granulation tissue in the apical portion of the root.[22] However, the bone like material formed by the calcium hydroxide dressing was porous in nature.[23] There have been studies reporting increased risk of tooth fracture since many dressing changes are necessary till the formation of calcified barrier using calcium hydroxide.[24] Later MTA was used for apexification in teeth with open apex.[25] MTA has demonstrated the ability to stimulate cells to differentiate into hard tissue matrix. Despite its good physical and biological properties, extended setting time has been a main disadvantage.[26] In this case, Biodentine a material consist of tricalcium silicate, calcium carbonate and zirconium dioxide as power and calcium chloride as liquid was used as an apical barrier. When the material is placed in the root apex it forms a micromechanical bond with the dentin via crystal growth within the dentin tubules. This micromechanical bond leads to possible ion exchanges between the cement and dentinal tissues forming a tag like crystalline structure within the dentinal tubules.[27] Biodentine apical plug of 5 mm was placed as a barrier and remaining canal space till CEJ was obturated with gutta percha in single visit. An adequate apical seal of 4-5 mm is required to prevent re-infection of the canal.[28] Access cavity and the fractures crown was restored using composite restoration to avoid microleakage. Healing of the periapical lesion was noted at 6 months interval. At the end of 24 months, clinical and radiography examination was done to evaluate the success of biodentine as a material for apexification procedure.

CONCLUSION

In case of non vital open apex root with periapical lesion, proper disinfection and controlled placement of barrier at the apex will result in predictable healing. After long term follow up, Biodentine is considered to be an effective material for management of teeth with open apex.

REFERENCES

1. Steiner JC, Dow PR, Cathey GM. Inducing root end closure of non-vital permanent teeth. J Dent Child 1968 Jan;35(1):47-54.
2. Cvek M. Endodontic treatment of traumatized teeth. In: Andreasen JO. Traumatic injuries of the teeth. Philadelphia: Saunders, 1981:321-387.
3. Dylewski JJ. Apical closure of non-vital teeth. Oral Surg Oral Med Oral Pathol 1971 Jul;32(1):82-89.
4. The international Association for Dental Traumatology. Guidelines for the management of traumatic dental injuries. Dental Traumatology. 2012 Feb;28(1):2-12.
5. Kinirons MJ, Sutcliffe J. Traumatically intruded permanent incisors: a study of treatment and outcomes. British Dental Journal1991;170:144-146.
6. Das S. Apexification in a nonvital tooth by control of infection. J Am Dent Assoc 1980 Jun;100(6):880–881.
7. Morse DR, O'Larnic J, Yesilsoy C Apexification: review of the literature. Quintessence Int 1990 Jul; 21(7): 589-598.
8. Feiglin B. Differences in apex formation during apexification with calcium hydroxide paste. Endod Dent Traumatol 1985 Oct;1(5):195-199.
9. Sheehy EC, Roberts GJ. Use of calcium hydroxide for apical barrier formation and healing in non-vital immature permanent teeth: a review. British Dental Journal.1997 Oct; 183 (7), 241-246.
10. Torabinejad M, Smith PW, KetteringJ, Pittford TR. Comparative investigation of marginal adaptation of mineral trioxide aggregate and other commonly used root-end filling materials. Journal of
11. Endodontics, 1995 Jun; 21(6): 295-299.
12. Maroto M, Barberia E, Planells P, Vera V: Treatment of a non-vital immature incisor with mineral trioxide aggregate (MTA). Dent Traumatol 2003 Jun; 19(3): 165-169.
13. Mafter M. Apexification: a review. Dent Traumatol. 2005 Feb; 21(1): 1-8.
14. Stewart DJ. Root canal therapy in incisor teeth with open apices. Br Dent J. 1963; 114:249–254.
15. Ball JS. Apical root formation in non-vital immature permanent incisors. Report of a case. Brit Dent J .1964;116:166-167.
16. Joffe E. Complication during root canal therapy following accidental extrusion of sodium hypochlorite through the apical foramen. Gen Dent. 1991; 460-461.
17. Sabala G L, Powell S E. Sodium hypochlorite injection into periapical tissues. J Endod. 1989 Oct; 15(10): 490–492.
18. Emilson CG. Susceptibility of various microorganisms to chlorhexidine. Scand J Dent Res. 1977 May;85(4):255–265.

19. Wang CS, Arnold RR, Trope M, et al. Clinical efficiency of 2% chlorhexidine gel in reducing intracanal bacteria. J Endod. 2007 Nov;33(11):1283-1289.
20. Windley W 3rd, Teixeira F, Levin L, et al. Disinfection of immature teeth with a triple antibiotic paste. J Endod. 2005 Jun;31(6):439–443.
21. Hoshino E, Kurihara-Ando N, Sato I, et al. In-vitro antibacterial susceptibility of bacteria taken from infected root dentine to a mixture of ciprofloxacin, metronidazole and minocycline. Int Endod J .1996 Mar;29(2):125–130.
22. Walia T, Chawla H, Gauba K. Management of wide open apices in non vital permanent teeth with calcium hydroxide paste. J ClinPediatr Dent. 2000 Fall ;25(1):51-56.
23. Chosack A, Cleaton-Jones p. A histological and quantitative histomorphometric study of apexification of nonvital and permanent incisors of vervet monkeys after repeated root filling with a calcium hydroxide paste. Endodontics & Dental Traumatology. 1997 Oct; 13(5), 211–216.
24. Andreasen JO, Farik B, Munksgaard EC. Long term calcium hydroxide as a root canal may increase risk of root fracture. Dent Traumatol. 2002 Jun;18(3):134-137.
25. Simon S, Rilliard F, Berdal A, Machtou P: The use of mineral trioxide aggregate in one-visit apexification treatment: a prospective study. Int Endod J.2007 Mar; 40(3):186-197.
26. 26. El-Meligy OA, Avery DR. Comparison of Apexification with mineral trioxide aggregate and calcium hydroxide. Pediatr Dent. 2006 May;28(3):248-253.
27. Strassler HE, Levin R. Biodentine tricalcium-silicate cement material as an active biosilicate technology for direct and indirect pulp-capping. Inside Dentistry. 2011Nov;7(10):98-100.
28. Hachmeister DR, Schindler G, Walker WA, Thomas DD. The sealing ability and retension characteristics of mineral trioxide aggregate in a model of apexification . J Endod. 2002 May;28(5):386-390.

FIGURES:

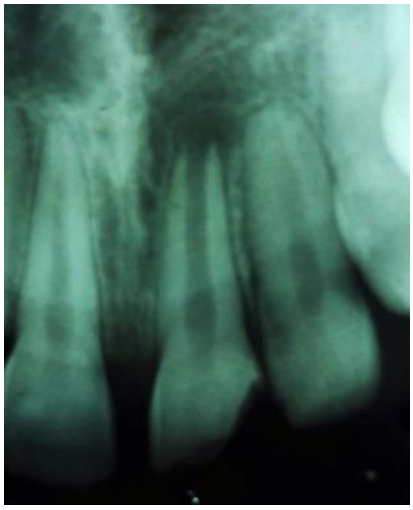

Fig. 1: Pre-operative radiograph showing fractured tooth 21 with open apex and periapical lesion

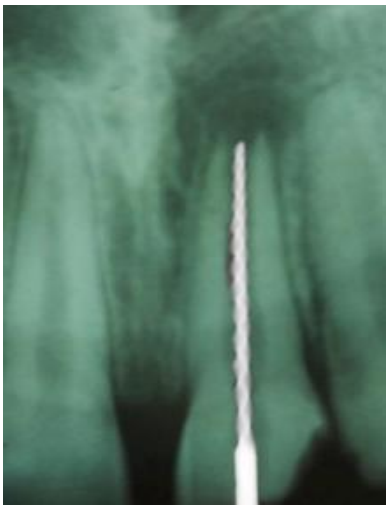

Fig. 2: Working length radiograph with H-file.

Fig. 3: Radiography showing Biodentine as an apical barrier.

Fig. 4: Immediate post –operative radiograph after Biodentine apexification.

Fig. 5: Follow up radiograph after 12 months.

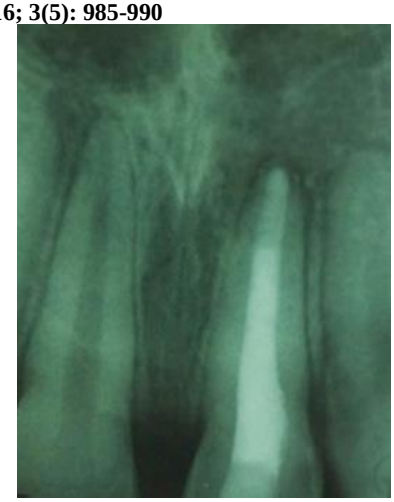

Fig. 6: Follow up radiograph after 24 months.