Single visit apexification of an immature non vital tooth

Sai Ganapathy¹, Karuna Sharma², Sanghamitra Jena³

¹Department of Conservative Dentistry & Endodontics, SGT Dental College, Gurgaon  
²Ganapathy’s Medical and dental center, SGT Dental College, Gurgaon  
³Dept. of Orthodontics and Dentofacial Orthopedics, ITS CDSR, Ghaziabad

Abstract: Immature teeth predisposed with necrotic pulp and large periapical lesions are a challenge to treat using conventional endodontic therapy, therefore application of materials like calcium hydroxide and mineral trioxide aggregate is indispensable in achieving apexification, in such cases. In the recent years there has been advancement in management of open apex cases by use of an apical plug. On the horizon a new calcium silicate based material, biodentine has been introduced for substitution of natural dentin wherever there is damage to natural dentin. Its properties have been reported to be very similar to portland cement and MTA. The positive outcome, clinically, in such cases encourages the use of biodentine as an apical barrier in single visit apexification procedures, as demonstrated by the following case report.

Keyword: Apexification, Barrier techniques, Biodentine

Introduction

Long term endodontic success depends on complete asepsis and three dimensional obturation of root canal space. Immature teeth and absence of natural apical constriction creates a challenge for the endodontist worldwide. After eruption to upto 3 years the physiological closure of the apex occurs on completion of root development, however in an event of pulpal necrosis following trauma, caries or other pulp affecting pathoses, there occurs an interruption in dentine formation thereby seizing root development and causing widening of the root canal making its walls thin and fragile with an open apex. [1]

These factors cause impairment in root canal instrumentation and an adequate apical stop may be difficult to achieve, therefore provision of an apical barrier or a stop is one of the primary aims of endodontic therapy in these cases.

Using a technique called apexification [2] a root canal filling material can be successfully placed against the so achieved apical stop preventing over extrusion and is aided by the use of several materials such as calcium hydroxide paste, calcium hydroxide powder applied with different vehicles,[3] tri calcium phosphate[4] osteogenic protein-1, bone growth factor and oxidized cellulose,[5] proplast, (a polytetrafluoro-ethylene -like porous material),[6] dentin chips,[7] bone ceramics[8] and many more. Antibacterial pastes have also been used effectively to promote apexification,[9,10]. Revascularization has also been promoted as treatment strategy but has its own limitations.[11] Amongst these, MTA has been extensively used for one visit application due to its biocompatibility, regenerative potential[12] and superior sealing characteristics,[13] however its prolonged setting time[14,15] , difficult handling, low compressive strength,[16,17] high viscosity, low washout resistance[18,19] and high cost raises some concerns about its use.[20-21].

To overcome these problems, a new calcium silicate based material Biodentine (Septodont, SaintMaurdesFossés, France), has emerged displaying the chemical properties of MTA without its negative aspects.[22,23,24]. Modification in the physical properties has been brought in Biodentine by modifying powder composition along with addition of setting accelerators and softeners and its supply in the form of capsule formulation that can be used in a mixing device which largely improves the clinical performance by making it user friendly with a shorter setting time.[25,26,27]

In the case report that follows the patient presented with symptomatic teeth having an immature apex and a large periapical radiolucency which were treated non surgically using Biodentine which lead to healing of periapical radiolucency and patient became asymptomatic high lightening the benefits of Biodentine when used in this particular case.

Case report

16 year old patient, Ajay reported to the department of conservative dentistry and endodontics in SGT University with a chief complaint of pain and swelling in his left upper anterior teeth. The patient reported of trauma in the same teeth at the age of 7 years. On examination of the tooth and after performing cold pulp test for vitality, to which it gave a negative response indicated that the tooth was non
vital. An intraoral periapical radiograph was taken which showed that the tooth in concern was an immature tooth having a wide open apex and a radiolucency close to it. [figure 1].

Under Local anaesthesia an access opening was done followed by working length determination using periapcal radiograph as well as paper point. Biomechanical preparation was done using step back technique upto 80 # K-File. Irrigation was performed using alternative use of 2.5% sodium hypochlorite and saline. The canal was then dried using paper points and intracanal medicament in the form of calcium hydroxide was placed in the canal and access cavity was sealed with temporary material Cavit (3M ESPE).

After one week patient was recalled and canals were cleaned of calcium hydroxide paste using hand H- files to working length and with help of alternate irrigation regimes of 3% sodium hypochlorite and 17% EDTA. Saline was used as a final rinse and canals were dried with paper points. According to manufacture instructions Bio dentine was then mixed and moved into the canal with the help of amalgam carrier and with help of plugger, plugged to the apex in increments so as to achieve a apical plug of 5mm thickness. A radiograph was then taken for confirmation of the same.[figure 2].

The walls having any excess material were cleaned using butt end of paper point and after a period of 12 minutes a plugger was used to check the hardness of biodentine to confirm its proper setting. The canal was then obturated using thermo plasticized gutta-percha technique(backfilling) using obtura- 2 gun and AH Plus root canal sealer. The access cavity was then sealed with permanent filling.

Patient was recalled after 3 months and on examination, signs of periapical healing and bone formation were present. [Figure 3]. The patient was put on a follow up regime and recalled again after one year. After one year it was observed that there were definitive signs of healing evident both clinically and radiographically. Patient was asymptomatic and radiograph revealed healing of periapical radiolucency with regeneration of tissues. [figure 4].
Discussion

There is a revolution in the field of dentistry all over the world with the introduction of Biodentine by septodont.[22] It is the only dentin substitute that is bioactive as well as biocompatible and is based on active Biosilicate Technology. It is helpful in treating teeth with damaged dentine. Its wide range of use is significant in both, restorative dentistry and endodontics.[22,23] Its tricalcium silicate core evokes no adverse tissue response, and therefore is biocompatible. When used in pulp capping it helps to preserve the pulp vitality by promoting reactionary dentine formation, and has excellent sealing properties thereby reducing the incidence of clinical failures due to bacterial micro leakage thus preventing postoperative sensitivity.

It is technique friendly and needs no surface conditioning or bonding and also has a quick setting time thus minimizing the working time.[23,24,25] MTA can also be used as an alternative treatment modality in immature pulp less teeth. However the chief disadvantage of MTA is its long setting time, difficult handling, discoloration (gray MTA) and high cost due to which Biodentine is advocated as a better material than MTA when used to induce apexification.[28,29]

Biodentine is a dentin substitute with an alternative use as an endodontic repair material. [26,27] Composition of the powder consist of tricalcium silicate as the chief ingredient with calcium carbonate and zirconium oxide, whereas the liquid consist of calcium chloride in water. Biodentine can be used as a superior alternative to MTA as seen in this case report due to its improved mechanical properties that are comparable to natural dentine. This material is stable, less soluble, non resorbable, hydrophlic, easy to prepare in place with a lower setting time producing tighter seal. This has helped in lessening the treatment time for the patient between his first appointment to final restoration. All this has been possible because of proper cleaning and shaping of canal followed by apical seal with a material that has promoted regeneration and healing.[30,31]

As demonstrated through this case report the deliberate over instrumentation of the periapical area that produces a blood clot[33] to induce apical closure was contraindicated due to time constraint, therefore an alternative approach that produces effective cleaning and shaping of the root canal and induces apical closure with a material that favours regeneration was required.

Biodentine was chosen to produce significant results in less time by exploiting its regenerative properties and superior physical charateristics with less cost and less chair time while maintaining the properties of MTA and proves to be a new age alternative to conventional approaches with distinct advantages in the treatment of teeth with open apex.

Conclusion

The case reports thus encourages the use of Biodentine in single visit apexification procedure in a teeth with open apex and a large periapical lesion. As seen in the case report the use of Biodentine has promoted faster periapical healing and has many advantages over its other counterparts thus promising the use of bio dentine as a better substitute in near future.

Reference:
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