Case Report

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Imperative Role of Endosequence Root Repair Material in Apexification Procedure in Maxillary Central Incisor

Deepti Bindal[1*] Diksha Tomar[2]

[1]Reader, Department of Conservative Dentistry and Endodontics, Shree Bankey Bihari Dental College and Research Centre, Ghaziabad, UP, India.
[2]PG Student, Department of Conservative Dentistry and Endodontics, Shree Bankey Bihari Dental College and Research Centre, Ghaziabad, UP, India.

ABSTRACT

Background: Promising clinical results and studies comparing endosequence root repair material to MTA in biocompatibility, sealing, bioactivity and antimicrobial properties favour its use for Apexification procedure. Some in vitro studies indicate these materials to reinforce the roots and increase their resistance to fracture. This report describes the successful treatment of a young boy with a traumatized incisor that developed into a malformed, immature, tooth that needed prompt relief when he developed a labial sinus with symptoms of pain and was referred for endodontic treatment. The right central incisor was endodontically treated with apexification using Endosequence repair material to form an apical barrier. Follow up recalls exhibited healing bone formation and root maturation indicating successful prospective outcome for the material.

Keywords: Apexification, Endosequence, MTA, Trauma.

INTRODUCTION

Apexification endodontic therapy aims at resolving the infectious condition and inducing apical root end closure of immature teeth for favorable obturation. Endodontic care for the teeth that are traumatized in early childhood leading to infected pulp, chronic abscess and sinus formation is challenging and complicated. The successful treatment of the malformed, immature maxillary central incisor with destruction of surrounding bone and associated sinus has been described in this case report. Radiographically because the tooth presented extremely wide open apex with thin canal walls the main concern was sealing the open apex and formation of a physical barrier. Additionally periapical and cervical bone loss made the prognosis unpredictable. Advancements in nanoparticle biomaterials are assuring successful clinical results in various endodontic difficult situations where previously extraction of the tooth was the only protocol available.[1]

MTA has been successfully used as an apical barrier in open apex teeth with predictable results.[2] Certain limitations of extended setting time, discoloration of teeth and difficult placement protocol are restricting its use clinically. A new generation biocompatible, nanoparticulate, premixed, root-end filling material Endosequence (BC RRM Brasseler, Unites States of America) has been investigated and clinically proven to have excellent mechanical and biological properties that can be used as an endodontic repair material.[1-4] It had the highest compressive strength and the lowest porosity of the evaluated bioceramic cements.[2]

Its sealing ability is comparable to MTA and consists of Tricalcium silicate, dicalcium silicate, zirconium oxide, tantalum oxide, calcium phosphate monobasic and fillers as stated by the manufacturer.[3,5] Many in vitro studies have provided positive results showing potent antibacterial properties due to a high pH during

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***Correspondence Dr. Deepti Bindal.**
Department of Conservative Dentistry and Endodontics, Shree Bankey Bihari Dental College and Research Centre, Ghaziabad, UP, India.
Email: diptibindal@gmail.com

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Fig 1: Photograph showing Malformed fractured incisor with labial sinus.

Fig 2: IOPA of open apex incisor with cervical bone loss and periapical radiolucency

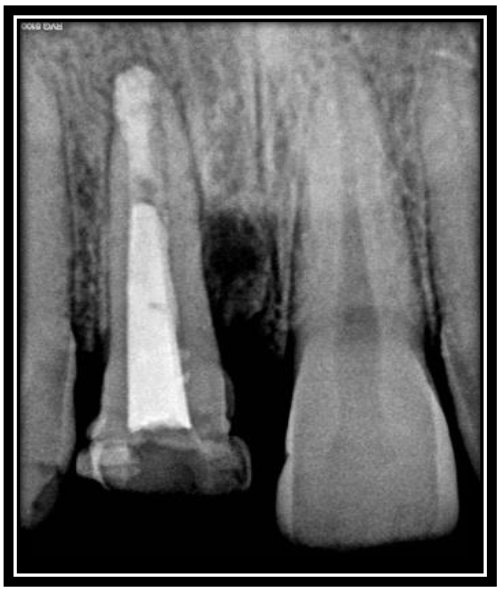

Fig 3: IOPA showing apical plug of Endosequence and obturation

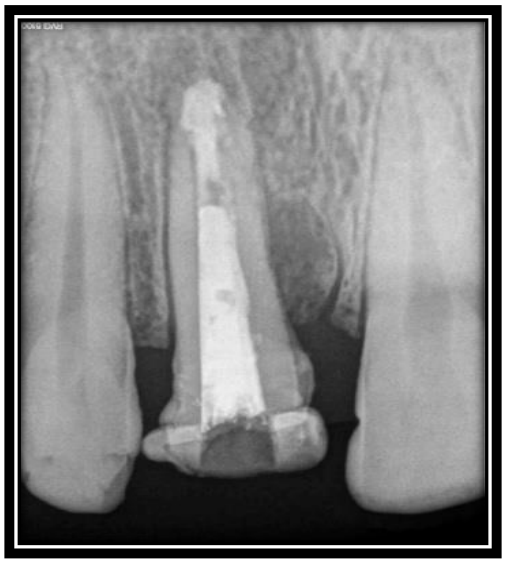

Fig 4: IOPA after 12 months recall showing bone formation and root elongation.

Fig 5: Endosequence BC RRM-Fast set Putty.

setting excellent biocompatibility, and significant induction of bone and periodontal regeneration when used as an apical barrier in apexification.[4,6-8] Studies comparing their osteogenic potential Endosequence root repair material significantly increased alkaline phosphatase and bone sialoprotein expression compared with MTA and thus promotes osteoblast differentiation better than MTA.[6-8] Several in vitro studies on cytotoxicity report that the cells required for wound healing attach to the bioceramic repair material and produce replacement tissue.[10-11]

The particle size of MTA has been reported to be approximately between 1-30 microns whereas Endosequence reports particle size to be 0.35 microns. The decreased particle size offers improved ease of clinical handling and placement technique, shorter setting time, uniform consistency

suggesting that it can be used as an alternative to MTA.[9] Nanoparticle size also affects the initial strength of the material. They are hydrophilic, insoluble, aluminum free with high Ph of 12.7.[9] Treatment planned in this report was apical barrier placement for the incisor by apexification procedure using premixed syringed Endosequence.

CASE REPORT

A 15-year-old male patient with a noncontributory medical history presented with chief complaint of pain and sensitivity in upper front teeth since 15-20 days. Clinical examination revealed a fractured, discolored, malformed right central incisor that responded with pain to percussion and palpation (Fig 1). A pin point sinus tract opening was visible labially just above the incisor. Radiographically the incisor showed an immature, wide open apex associated with a periapical radiolucency and a mesial cervical bony defect (Fig 2). Additionally the root had thin walls of the canal suggesting long delayed trauma that was not treated and has now made the prognosis unpredictable. Based on the findings a diagnosis of immature tooth with necrosed pulp and chronic abscess was established

The treatment plan presented to the patient was Apexification with Endosequence bioceramic paste as root end filling. After predictable bone repair and resolution and periodontal healing the patient was assured of cosmetic enhancement. Patient approval was taken and endodontic treatment was initiated with access preparation in 11 followed by preparing the canal till size no.80 hand K-file till working length slowly to prevent fracture of the thin canal wall**.** Copious irrigation with 2.5% sodium hypochlorite solution and saline alternatively were used as an irrigant. Metapex intracanal medication was placed for one week and repeated thereafter. Antibiotics and analgesics were prescribed. The tooth became asymptomatic with healing of the sinus tract opening after the first visit.

Regression of the symptoms and the healing of the labial sinus were positive improvements. After three applications of Metapex the canal was finally cleaned using 2.5% sodium hypo-chlorite solution, and Ultrasonic tip and dried with paper points. A New endosequence root repair paste supplied in syringe form by the manufacturer was placed at the apical end with the aid of pluggers in the last 3-4 mm of the root canal forming an apical plug. Being in paste form it could be easily placed and adapted to the walls of the canal with pluggers. The tooth was obturated using Adseal sealer (Meta) and C-fill obturation system (Fig 3).

Postoperative radiographic and clinical evaluations were performed at 3, 6, and 9 and 12 months recall. Comparison of radiographic images was performed to ascertain bone healing and apical closure of the open apex. Considerable dense healing bone of the periapical and cervical region could be confirmed (Fig 4).Finding showed root maturation with distinct periodontal ligament surrounding the root length suggesting that endosequence is a bioactive material leading to surrounding bone growth thus increasing root strength (Fig 5). Further long term clinical studies are necessary to evaluate the effect of endosequence for endodontic care.

DISCUSSION

Trauma in children can prevent further development of the tooth leading to malformation of the crown and immature root in permanent teeth. Essentially the new generation of biocompatible, nanotechnology based biomaterials have been successfully competitive in conserving the natural root structure by regeneration of the surrounding hard tissue when direct contact with biological tissues is possible during Apexification procedure.[12-15] A recent histologic study suggests that the calcified material deposited on the canal wall is not dentin but bone or cementum.[15] Endosequence Bioaggregate a supposedly novel material was investigated for mineralogy, microstructure and bioactivity by Camilleri. Their findings characterized Endosequence to release calcium hydroxide in solution which when in contact with tissue fluids forms hydroxyapatite.[14] The nanoparticulate size of the Endosequence assures proper viscosity and easier placement in difficult open apex for barrier. Additionally the syringed form provides the clinician with firm and moldable material rather than MTA that has to be mixed to desired consistency. The technique has definitely been upgraded.

Efforts to place an Endosequence apical barrier proved to be successful in formation of root

end with definitive root end closure and root elongation as can be appreciated in the radiograph. Increase in root thickness suggesting the regenerative potential of the new bioceramic. Healing of surrounding bone occurred because of its osteogenic potential as it also exhibited best resistance to leakage.[6,16] More clinical updates and more availability of the material by the manufacturer are required for better endodontic care.[17]

CONCLUSION

Apexification using Endosequence apical barrier provides easier placement and ensures results comparable to other techniques. It is definitely an upgradation of the endodontic requirement to achieve healing of the tissues for the strength and maintenance of the affected tooth. The material demonstrated excellent biocompatibility and may be an advantageous clinical choice.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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