Case Report

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Root-End Closure of Pulpally Involved Anterior Teeth Using Metapex: A Case Series

Nidhi Bhatia, PurshottamJasuja, Charu Nijhawan, Heena Khurana, Anshu Sharma and Harveen S. Kalra*

Department of Pedodontics, Genesis Institute of Dental Sciences & Research, Ferozepur, India

ABSTRACT

Management of pulpally involved teeth with immature apices is a difficult task for the clinicians. Despite major advances in biomaterials and technologies, successful closure of root apex depends upon the accurate diagnosis and treatment planning. Apexification is defined as "a method to induce a calcific barrier in a root having an open apex or the continued root development of an incomplete root in teeth with necrotic pulp". The present paper represents a case series of management ofpulpally involved teeth with immature apices using Metapex(MetaBiomed Co., Ltd, Korea) as an apexification agent. In all the above cases successful closure of immature apices occurred though closure timings were different for all the cases.

Keywords: *Apexification, Metapex, Open Apices.*

Introduction

The closure of the root apex in permanent teeth takes a minimum of three years after its eruption. Consequently, any pulpal injury occuring during this period can impair root end completion and apical closure then becomes a challenge.

Apexification is defined as "a method to induce a calcific barrier in a root having an open apex or the continued root development of an incomplete root in teeth with necrotic pulp".[1] Successful apexification depends on an accurate diagnosis, an understanding of the biological processes involved, clinical skills and materials used.[2]

A commercial product named Metapex (MetaBiomed Co., Ltd, Korea) is been used as a root canal filling material in primary teeth. It contains iodoform (40.4 %), calcium hydroxide (30.3%), and silicone oil (22.4 %). However, very few studies have reported on the efficacy of this material when used for apexification.[3,4] The present article reports on the cases in which Metapex was used to promote root-end growth and apical closure (apexification) in an immature permanent tooth.

Case Report

Case I: A 12-year-old male patient reported to the Department of Pedodontics and Preventive Dentistry with a chief complaint of discoloured left upper anterior tooth (21). Past history revealed of trauma to the upper anterior region 4 years back. Then there was pain on biting from upper anterior region from the last few months. On clinical examination, incisal edge of 21 was fractured. The tooth was tender on percussion with no intraoral sinus tract. The tooth tested negative for the electric pulp test. Radiographically, the tooth exhibited incomplete root formation, characterized by a wide root canal and an associated periapical lesion with the same. (Figure 1a) Apexification was planned for 21 with Metapex (calcium hydroxide and iodoform) followed by obturation with gutta-percha after closure of the root apex. After isolation, access opening was done, and the necrotic pulp tissue was removed. Working length was determined and the canal was cleaned till size 70 K-file. (Figure 1b) Copious irrigation was done with 1% sodium hypochlorite and normal saline solution. The canal was then dried by sterile paper points and metapex was placed into the canals till the apex using lentulospirals followed by restoration with glass ionomer cement (GC 2, GC Corporation, Japan). The patient was recalled after 2 weeks and the tooth was completely asymptomatic. Regular follow-ups were done at the interval of 6 months. (Figure 1c) After 6 months, the radiolucency had reduced to half of its size as compared to the initial size. Follow-up radiograph at 12 months showed complete healing of the radiolucency and a calcific barrier was visible in the radiograph. (Figure 1d) The apical closure was confirmed by using a Gutta-percha (GP) point to check for the presence of a resistant "stop" and absence of hemorrhage, exudates or sensitivity. Metapex was removed from the canal and 21 was obturated with gutta-percha and a full coverage crown was placed on the tooth later.

Case II: A 9-year-old female patient reported to the Department with the chief complaint of pain in the upper front tooth region since 3 days. There was a history of trauma to the same tooth due to fall about 10 days back. On clinical examination, Elli's Class III fracture in permanent

maxillary left central incisor was evident. Periapical radiograph showed incomplete root formation with wide open apices for the same tooth. (Figure 2a) Apexification with Metapex dressing was planned and all the above said procedures were followed. (Figure 2b) Patient did not come up for follow up. After 15 months, radiograph showed complete formation of the root apex in maxillary left central incisor, without any signs and symptoms and periapical radiolucency. (Figure 2c) In the next visit, complete obturation was carried out with GP using lateral condensation technique followed by composite restoration.

Case III: A 13 year old boy came to the Department of Pedodontics and Preventive Dentistry with the chief complaint of pus discharge in relation to the upper anterior tooth region. There was a history of trauma due to fall 4 years back. Clinical examination revealed fractured tooth 11 and 21 involving the pulp. Sinus opening was present near the root apices of both the central incisors. The teeth were not tender on percussion and there was no pain on palpation. Labial mucosa adjacent to the concerned teeth was inflammed. Radiograph revealed blunderbuss open apices with thin dentinal walls wrt 11 and 21. (Figure 3a) Small periradicular lesions were evident associated with the root apices of the tooth 11 and 21. Apexification with Metapex dressing was planned with all the relevant steps and restored with glass ionomer cement. (Figure 3b) Patient was recalled after every 6 months. After 6 months there was radiographic evidence of healing at the apex. (Figure 3c) At 12 months complete formation of the root apex was seen without any signs and symptoms and periapical radiolucency. (Figure 3d) Obturation was then carried out with GP.

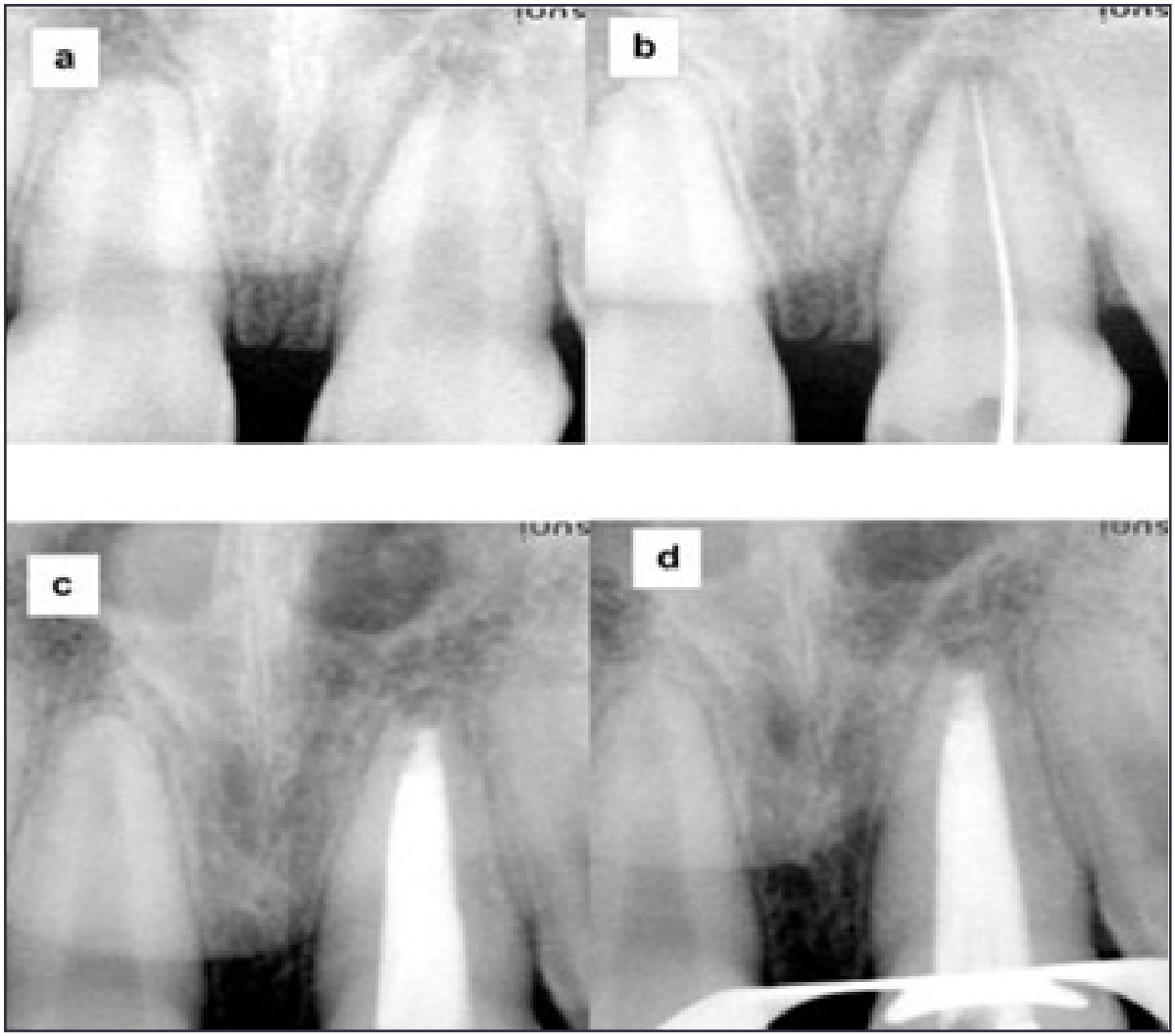

Fig. 1:-Case 1(a) Incomplete root apex and large radiolucency seen wrt 21(b) Working length determination wrt 21(c) Radiograph taken at the end of 6 months(d) Radiograph taken at the end of 12 months.

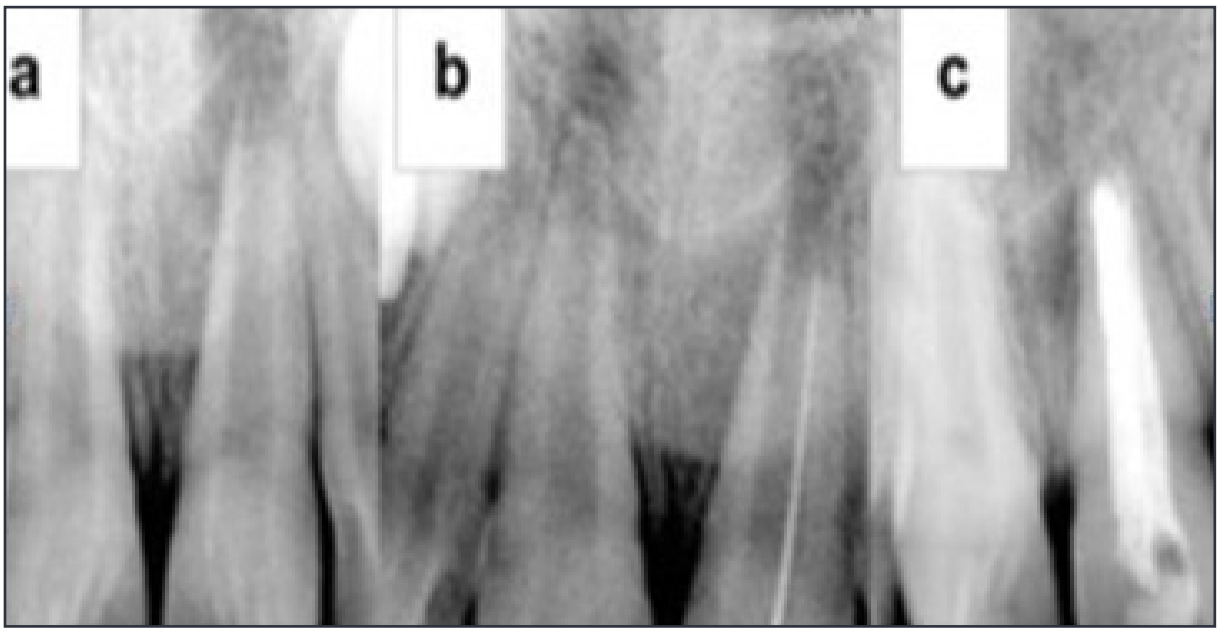

Fig. 2:-Case 2 (a) Incomplete root formation with wide open apices wrt 21(b) Working length determination wrt 21(c) Follow up after 15 months

Fig. 3:- Case 3 (a) Incomplete root formations with wide open apices with periapical radiolucencieswrt 11 and 21(b) Working length determination wrt 11 and 21(c) Radiograph taken at the end of 6 months(d) Follow up after 18 months.

Discussion

Physiological completion of root apex depends on the maintenance of vitality of the tissues that form root dentine and apical periodontal ligament. Hertwig's epithelial root sheath's (HERS) inductive action leads to the differentiation of cells of the dental papilla into odontoblasts, which progressively form the root dentine. With the onset of root formation, the initially formed dentine induces fragmentation of the HERS, which then becomes discontinuous and is permeated by cells of the dental follicle which undergo differentiation into cementoblasts close to the newly formed dentine.

Apexification can be achieved by placement of certain biocompatible materials in the root canals to the apical region. The most commonly used material for apexification is $Ca(OH)_2$ alone or in combination with other medicaments. Calcium hydroxide in contact with vital tissue in the apical area, seems to cause tissue reactions similar to those in the coronal pulp. Lu & Qin compared an antibiotic paste and Metapex paste for their use in apexification. Over a follow-up period of 30 months, they concluded that both materials showed the same level of radiographic success. But in cases where periapical inflammation was present, the antibiotic paste produced superior results.[3] In another study, Weng evaluated 64 younger permanent teeth with underdeveloped root apices and necrotic pulps. After the root canals were prepared and sterilized, Metapex paste was placed in an attempt to achieve apexification. All the teeth were observed for three years, and 24 teeth (37.5percent) successfully achieved apexification, 37 teeth (57.81 percent) were in the process of root end closure, and only 3 teeth (4.69 percent) failed to achieve apexification. Weng concluded that Metapex paste was an effective material for achieving apexification for younger permanent teeth.[4] Each of the present three cases shows clinical and radiographic evidence of success in achieving apexification.

Metapex, releases calcium hydroxide slowly and tends to remain in the canal and exert its effects over a considerable period of time.

A study by Ghosh *et al*., showed a 100% success with non-setting calcium hydroxide with iodoform (metapex) as compared with calcium hydroxide mixed with distilled water and non-setting calcium hydroxide without iodoform.[5]

A similar finding for apexification was reported by Gu et al. where there was complete root development and apical closure involving 7 teeth.[6] Ghose et al. described the barrier formed during apexification as a cap, bridge, or ingrown wedge that may be composed of cementum, dentin, bone, or osteodentin.[7]

In the present study, glass ionomer cement was used to restore the access cavity after placement of metapex in the root canal. This was done to provide an adequate coronal seal, and prevent any micro leakage. Ray and Trope have also stated that the quality of the coronal restoration is more significant than the quality of root canal treatment in eliminating apical periodontitis. Most of the treatment for immature root apices fails not due to failure to create a sterile field at the root apex but due to microleakage from faulty coronal restorations.[8]

The present case series indicate good results with metapex as an apexification agent taking into consideration the cost factors, ease of placement and radiographic interpretation.

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***Corresponding author:**
Dr Harveen S. Kalra, 13 New Jawahar Nagar, Jalandhar City, Punjab, India, 144001.
Phone: +91 9888813133
Email: veenu61183@gmail.com

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