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Management of a compromised tooth: apexification or extraction?

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Abstract

Apexification as a method is often employed to induce the formation of a dentinal bridge formation at the apex of a non vital, immature tooth, however it a highly unpredictable treatment modality. The present case report aims to highlight the application of MTA as an apical barrier and orthograde PRF placement beyond the apex for apexification of an immature, non vital tooth and healing of the periapical radiolucency associated with the tooth followed by internal radicular reinforcement using composite.

Keywords: open apex, apexification, mineral trioxide aggregate, case report

Introduction

Orofacial traumatic injuries are common among children and young adults often leading to pulp necrosis or inflammation in young permanent teeth that can subsequently cause cessation of root development with a compromised root apex closure. [1, 2] Such cases often pose as a challenge to manage because of incomplete root apex and thin dentinal walls. Apexification as a method is often employed to induce the formation of a dentinal bridge formation at the apex of a non vital, immature tooth. According to results of various studies, 79-96% f the cases have shown successful hard tissue barrier formation at the apex in 5-20 months of average time and calcium hydroxide is the most common material used to promote calcific barrier formation. [3]

This treatment modality is however, highly unpredictable and often presents with complications such as the friability of the temporary coronal restoration to reinfection, need for a high level of patient conformity, weakening of immature roots due to hygroscopic nature of calcium hydroxide.[4] According to Andreasen *et al*. long-term calcium hydroxide therapy may weaken immature roots and this has lead to studies to find alternate substitutes to conventional calcium hydroxide apexification. Mineral trioxide

aggregate (MTA) has gained popularity for formation of an apical barrier due to its biocompatibility and superior sealing abilities, less time required for procedures with predictable results.[1,5,6] Thin dentinal walls of such teeth are highy fracture prone and hence reinforcement with glass ionomer cements or composite is often recommended.[7]

The present case report aims to highlight the application of MTA and PRF for apexification of an immature, non vital tooth and healing of the periapical radiolucency associated with the tooth followed by internal radicular reinforcement using composite.

CASE REPORT

A 62-year-old male patient reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of a discolored maxillary right lateral incisor (Tooth #12) (Figure 1a). Patient gave history of dental treatment of the same tooth at the age of 8 years, following a traumatic injury. Medical history revealed that the patient had Type II diabetes, for which he was taking regular medication. Intraoral clinical examination revealed a discolored tooth with an open access and mild pain on percussion but the tooth gave a negative response to electric pulp testing suggestive of non vitality. Radiographic examination of #12 showed large periapical radiolucency in association with flared root canal and immature apex (Figure 1b). A diagnosis of previously initiated root canal treatment with chronic periapical abscess and open apex in relation to #12 was made.

The treatment options given to the patient were nonsurgical endodontic treatment with MTA apexification procedure and endodontic treatment followed by periapical surgery for removal of the lesion and retrofilling, or extraction followed by single tooth implant or fixed partial denture. Taking the age and medical history of the patient and with patients own consent, it was decided to opt for nonsurgical apexification using MTA.

Informed written consent was taken. The tooth was isolated under rubber dam and endodontic access cavity was modified, a periapical radiograph was taken to determine the working length which was kept 1mm short of the radiographic root end (Figure 2a). The canal was carefully cleaned with a hand file under irrigation using 1.3% NaOCl. Passive ultrasonic irrigation was carried with ultrasonic #25K-file (SatellacActeon Group, New Delhi, India) at a setting of 4.0 for 1 minute with NaOCl as an irrigant. The root canal was then dried with sterile absorbent points (Sure endo; Sure Dent Co. Ltd., Gyeonggi-do, Korea). Calcium hydroxide was placed in the root canal, and sealed with Cavit (3M ESPE AG, Seefeld, Germany).The patient was recalled after one week (Figure 2b).

A week later, the tooth was again isolated under rubber dam, and the calcium hydroxide dressing was removed by hand instrumentation, along with irrigation using 1.3% NaOCl and 17% liquid EDTA Smear Clear (SybronEndo, CA, USA).

It was planned to place a Platelet Rich Fibrin (PRF) membrane slightly beyond the radiographic apex to aid in the healing of the lesion. PRF was prepared using patients own blood after obtaining consent for the same. (Figure 3a) The membrane was pushed beyond the apex into the bony space formed due to the periapical lesion followed by placement of a collagen sponge that was compressed with a hand plugger till radiographic root end (Figure 3b). A thick mixture of White ProRoot MTA (Dentsply, Switzerland) was then prepared and applied to the apical portion of the canal using a small plugger and the butt end of sterile gutta percha point to form an internal barrier of approximately 2-3mm (Figure 3c and 3d). Excess material was cleared from the walls and the internal aspect of the

canal walls were carefully etched with phosphoric acid followed by copious rinsing with saline to remove all traces of etchant. Canal was completely dried using ISO size #80 paper point (Dentsply Maillefer, Tulsa, OK). Using a microbrush, a dentine bonding agent (Clearfil Liner bond 2, Kuraray) was applied and cured and restorative composite resin material (Z100, 3M Dental Products) was dispensed and packed into the root canal and cured to reinforce the tooth root (Figure 4a). At the 1 year follow up visit, patient was asymptomatic and considerable healing of the periapical lesion was evident on the radiograph (Figure 4b).

Discussion

Root-end closure also called as apexification is the process of induction of an artificial calcified barrier across the open apex in an immature root with a considerably wide apical opening that may have apically diverging or parallel thin canal walls. The goal of such a treatment modality is to form an apical barrier that prevents passage of bacteria and its byproducts between the periapical space and the root canal, overall ensuring prevention of infection and successful treatment outcome. [8]

Other factors essential for thorough debridement and disinfection of the root canal space include irrigation and intracanal medication. In the current case report passive ultrasonic irrigation was carried out in accordance with previous studies that have exhibited more effective elimination of debris and bacteria in intricate root canal spaces with ultrasonics compared to conventional syringe irrigation. Calcium hydroxide paste was placed as a medicament to create an environment conducive for the formation of an apical barrier with MTA in subsequent appointment.

MTA apexification represents a primary monoblock with excellent biocompatibility. The success of MTA apexification has been attributed in various studies to its alkaline pH and the presence of calcium and phosphate ions in its formulation that create a favourable environment for the formation of hard tissue apical barrier. [9,10,11] In the present case report an approximate 2-3mm MTA barrier showed a significant hard tissue formation at the one year follow up visit.

However a major problem in cases of a wide open apex is to confine MTA to the canal space during compaction, and avoiding the extrusion of MTA, that may cause potential toxicity. Lemon advocated the use of a matrix to avoid extrusion and promote overall periapical healing. [12,13] In the present case, collagen membrane was used as a matrix which aided in sealing off the canal from periapical area and also aided in haemostasis. PRF as a material is also commonly used as a matrix and also in surgical management of periapical lesions. [14] In the current case, non surgical placement of PRF was done through an orthograde approach by pushing the membrane beyond the open apex into the bony space created by the periapical lesion. This proved to show favourable healing of the lesion at the follow up visit. Therefore orthograde placement of PRF can be carried out in cases of immature apex associated with periapical lesions to promote healing. It is a more conservative non surgical treatment option to avoid surgical flap reflection and osteotomy and allow for a less invasive approach to achieve healing.

Anterior teeth with flared canals carry a higher risk of fracture, because the strength of any tooth is directly related to the bulk of the remaining dentin. Thus it is imperative that the remaining tooth structure be reinforced with a strong substitute. In the present case, composite was chosen to reinforce the tooth.

Therefore, treatment of immature teeth with periapical lesions often pose a challenge due to variety of factors and an overall synergistic approach with various

materials can help to attain a successful treatment outcome.

Conclusion

A synergistic approach with the use of MTA apical barrier using a collagen internal matrix and a PRF membrane pushed beyond the wide apex to aid in healing of periapical lesion was employed in the present case report.

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Legends Figure

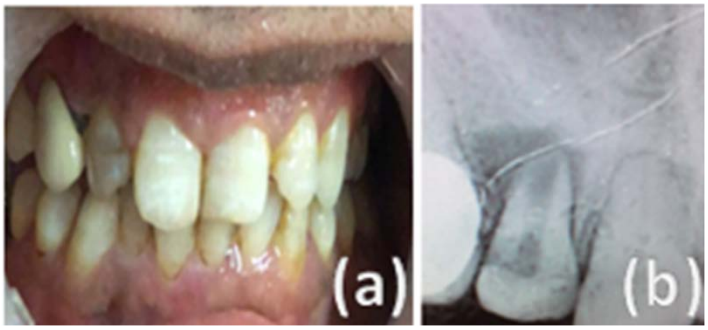

Figure 1: Preoperative photograph (a) and radiograph (b)

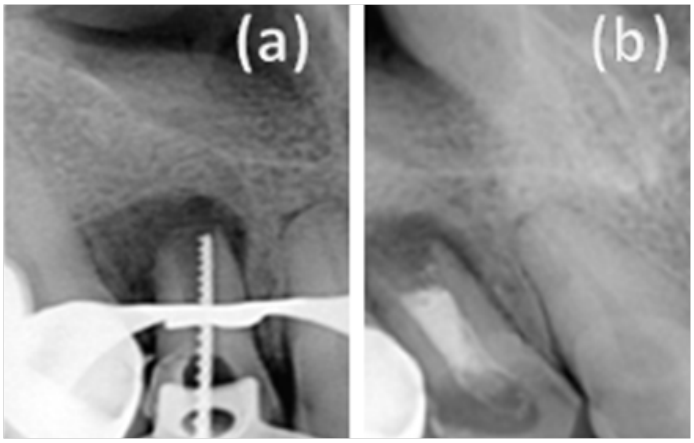

Figure 2: Working length determination(a) and Calcium hydroxide dressing(b)

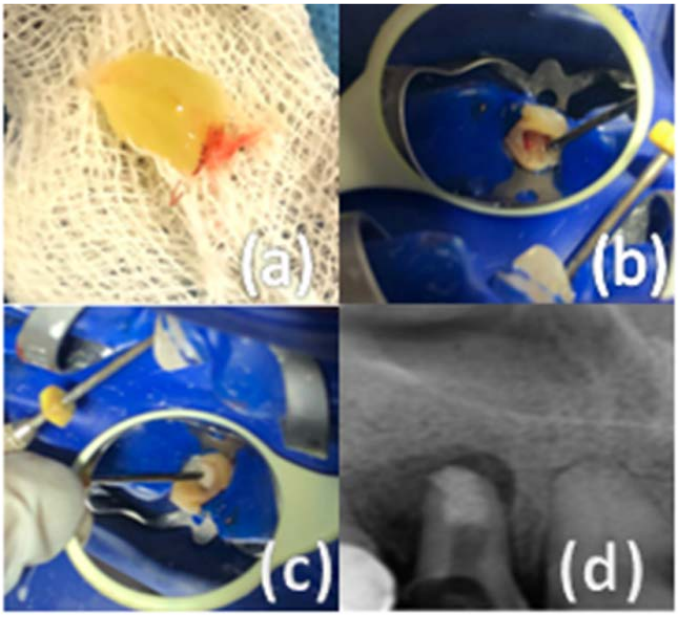

Figure 3: a) PRF Membrane (b) placement of collagen sponge (c) MTA placement (d) MTA apical barrier

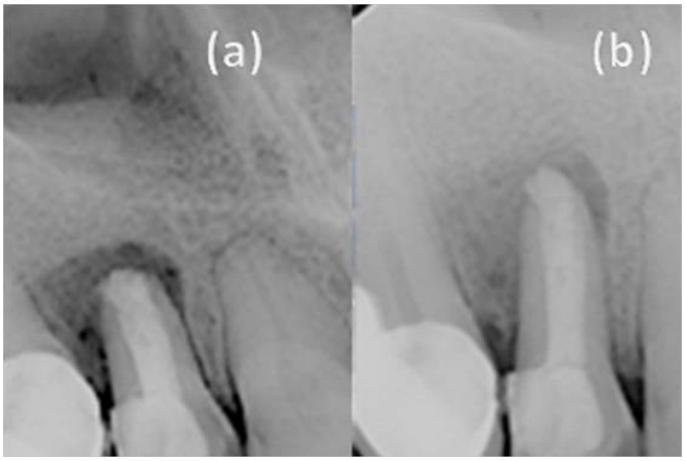

Figure 4: (a) Post operative radiograph with composite reinforcement (b) 1 year follow up radiograph