Case Report on Apexification with Portland Cement in Children

Neha Bhadoria

Senior Lecturer, Department of Pedodontics, Index Institute of Dental Sciences, Index City, Nemawar Road, Nh-59a, Indore. (M.P). India. (Corresponding Author)

ABSTRACT

Apexification is a method of inducing formation of a calcified barrier in the root with an open apex or the continued development of an apical part of incomplete root in teeth with necrotic pulp. Different treatment modalities exist i.e. surgical and non surgical. Portland cement score over the other materials in reducing the number of visits required to achieve apexification. This case report shows the use of Portland cement as an alternative to MTA.

KEYWORDS: **In office Bleaching, Pola Office, Discoloration**

INTRODUCTION

Traumatic injuries to the oro-facial region often involve teeth as a result, leads to pulpal inflammation and necrosis. If an injury occurs prior to the completion of root apex, further development is arrested leading to open apex. Success in such cases would require a "closed apex" which can be achieved through the process of apexification.[1]

Apexification is defined as 'a method to induce formation of a calcified barrier in the root with an open apex or the continued development of an apical part of incomplete root in teeth with necrotic pulp.[2] For management of Apexification, 2 types of treatment modalities exist surgical and non surgical. Surgical management was first reported by Dawood and Pittford in 1989 which involves obturation of root canal by Thermo plasticized gutta percha followed by periapical curettage.[3] Nonsurgical techniques involve short fill technique, customized cone technique& Apexification with various materials.[4]

Apexification with various materials for the establishment of an apical barrier was proposed by Kaiser 1960 however, opinion differs from the use of various materials several procedures utilizing, different materials have been recommended to induce root end barrier formation. Calcium hydroxide with or without antiseptic, freeze-dried allogenic dentin powder, bone ceramic, tricalcium phosphate, osteogenic protein, collagen, calcium gel and recently MTA and Portland cement are materials which have been evaluated extensively. MTA and Portland cement score over the other materials by reducing the number of visits required to achieve apexification.[5] However, previous studies reveal that MTA has some drawbacks as well, due to this and low-cost authors suggested the use of Portland cement as a substitute to MTA in this case.

CASE REPORT

A 14-year-old female patient came with the chief complaint of dull continuous pain and pus discharge in the upper front tooth region of the mouth. Clinical examination revealed discolored upper left maxillary central incisor with Ellis Class IV fracture (Fig. 1). Radiographic examination revealed improper obturation with periapical radiolucency and an immature wide open apex (Fig. 2). The Tooth was not tender to palpation and percussion.

Figure 1

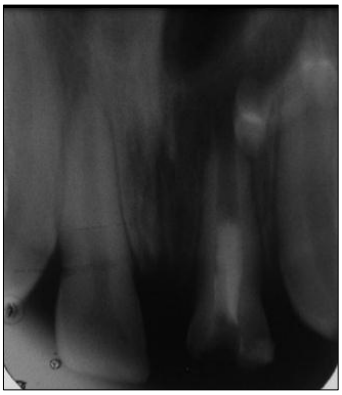

Figure 2

How to cite this article:
Neha Bhadoria. Case Report on Apexification with Portland Cement in Children. Int J Oral Health Med Res 2016;3(3):67-69.

Under Local anesthesia an access opening was redefined removal of old filling material was done followed by working length determination using periapical radiograph as well as the paper point. The biomechanical preparation was done using step back technique up to 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 with the help 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.

Bismuth oxide was added to the commercially available WPC in the ratio of 4:1 to

Gain radiopacity & the modified cement mixture was subjected to dry heat sterilization at 1700 C for 1 hr. WPC powder was mixed with sterile water, to a soft paste consistency. WPC was delivered to the apical portion of the canal (approximately 4 mm) using an amalgam carrier and modified pluggers.(Figure 3) A radiograph was taken to determine the correct placement of cement Cotton pellet moistened with sterile water was placed in the pulp chamber, and the access cavity was filled with temporary filling material. Patients were instructed to return next day. As the coronal structure was severely compromised post and the core was done. (Figure 4) Followed by

Figure 3

Figure 4

Figure 5

crown preparation and PFM crown was delivered to the patient. (Figure 5) The patient was recalled after 3 months and on examination, signs of periapical healing and bone formation were present. The patient has put on a follow-up regime and recalled again after one year.

DISCUSSION

Conventionally calcium hydroxide was the material of choice however Calcium hydroxide induced apexification requires 3 months to 24 months period. Also, long term use of it has resulted in weakening of root structure and has increased chances of reinfection.[6] over the time MTA has gained popularity and has become material of choice, but there are certain limitation with MTA such as its extended setting time, higher cost, difficulty in storage, and only be used in low-stress bearing areas. Gingival and tooth discoloration were reported from use of both, gray and White MTA.[7]

In the present case, patient was not willing for the prolonged treatment procedure, and affordability was low hence WPC was considered as the best alternative. PC is mainly composed of 65% lime, 20% silica, 10% aluminium and ferric oxide, and 5% other compounds. Two major constituents are tricalcium silicate (3CaOSiO2) and tricalcium silicate (2CaO-SiO2). PC sets through a hydration reaction in two stages, exactly similar that of MTA. Though Type I PC is pure PC, but all the types contain some amount of heavy metals. White PC is manufactured from purest raw materials (kaolinite with very low iron content) and contains no C4AF (ferric-calcium aluminate phase) and very Low MgO. The heavy metal content of WPC is almost similar to MTA.[8]

In 1999 Wucherpfennig showed through X-ray diffraction analysis that both MTA and PC have "identical characteristics"[9] after this study many in vivo and invitro studies have been performed. Studies have shown that the strength of set MTA is slightly higher than PC. Though MTA shows slightly higher setting time than PC, but the different is statistically insignificant.[10]

When evaluated in both Vitro and In Vivo tests, MTA, and PC showed comparative biocompatibility.[11] study have demonstrated that MTA and PC had no cytotoxic

effects on Chinese hamster ovary cells.[12] Histological evaluation of pulpotomies of dogs using MTA and Portland cement results showed that both were effective as a pulp capping agent. Another study showed that of MTA and Portland cement in furcation repair were similar up-to 50 days.[13]Major concerns with WPC is the amount of arsenic present in the material. Nevertheless, the levels of arsenic released were similar for PC and MTA and were below those considered to be dangerous.[14]

In our case reported WPC acted as an efficient apical barrier in the wide open apex of an infected root canal system. Healing was noted in a short span of 3 months. This report demonstrates the use of modified WPC can act as an efficient material for single sitting apexification.

CONCLUSION

As PC has shown similar characteristics to MTA with respect to its composition, biocompatibility, and through animal and clinical studies thus it can be used clinically. The disadvantage of PC is its lower radio-opacity, and the main advantage is the cost. A cheaper substitute of MTA will certainly benefit millions of people, especially in developing countries.

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Source of Support: Nil
Conflict of Interest: Nil