IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861. Volume 9, Issue 4 (Sep.- Oct. 2013), PP 66-69
www.iosrjournals.org

Repair of Furcal Perforation with Mineral Trioxide Aggregate: Case Report

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Abstract: *Furcal perforation is usually an undesired complication that can occur during preparation of an endodontic access cavities or exploring canal orifice of multirooted teeth. Inadequacy of the repair materials has been a contributing factor to the poor outcome of repair procedures. On the basis of the recent physical and biologic property studies of the relatively new introduced mineral trioxide aggretate, this material maybe be suitable for closing the communication between the pulp chamber and the periodontal tissues. There are few reports on repair of furcal perforation with MTA in molar teeth. The purpose of this case report was to describe the treatment of furcal perforation using MTA in molar teeth. The perforations were cleaned with NaOCl and saline solution, the tooth was endodontically treated and perforation was sealed sealed with MTA and coronally restored with posterior high strength glass ionomer cement and metal veneer crown. After 6 months, the absence of any radiolucency in the furcation area, pain along with functional tooth stability indicated a successful outcome of sealing perforation in 1 case.*
Keywords: *Iatrogenic furcal perforation, Repair, MTA, Root canal treatment*

I. Introduction

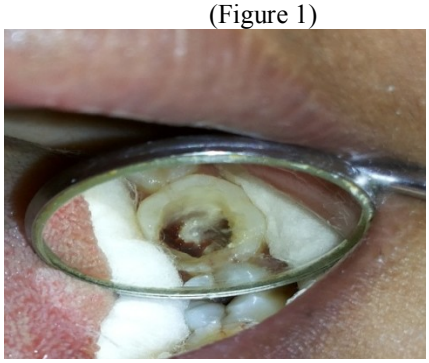
A major complication of endodontic and restorative treatments is accidental perforation of the roots or the pulp chamber floor. Such perforation may occur during nonsurgical root canal treatment or during preparation for a variety of restorative procedures.[1] The result is a chronic inflammatory reaction of the periodontium (characterized by the formation of granulation tissue) that can lead to irreversible loss of attachment or loss of the tooth.[2] Such perforations are managed surgically or non-surgically, depending on the particular characteristics of the case.[3] The prognosis may be questionable if treatment involves a lesion occurring at the level of the radicular furcation, but the prognosis is usually good if the problem is diagnosed correctly and treated with a material having suitable sealing ability and biocompatibility.[1] The prognosis also depends on the location, size and time of contamination of the lesion.[4] Various materials have been used in managing perforations, including zinc oxide–eugenol, amalgam, calcium hydroxide, composite resin, glass ionomer and resin-modified glass ionomer.[1,4] The ideal material for treating radicular perforations should be nontoxic, non-absorbable, radiopaque, and bacteriostatic or bactericidal; it should also provide a seal against microleakage from the perforation.[5] Mineral trioxide aggregate(MTA) has all of these characteristics and has been applied with good outcomes in root-end surgery, direct pulpal coverage, apexification, radicular resorption, and repair of lateral radicular and furcal perforation.[6] Its suitability for managing all of these problems can be attributed to its biocompatibility, its low induction of inflammation, its solubility, its capacity for creating a seal between the pulpal chamber and periodontal tissues and its repair capacity. The last of these features can in turn be attributed to the antimicrobial properties and high pH (12.5) of MTA, which promote growth of the cementum and formation of bone, which in turn allow regeneration of the periodontal ligament around the site of injury.[7] In this case report MTA was used to repair furcation perforation and the potential benefits of MTA and its relative case of use for management of perforation at easily accessed sites.

II. Case Report

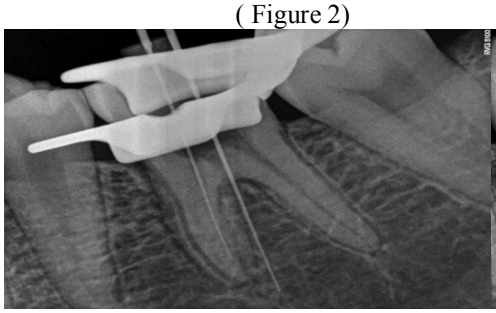
A 34-yr-old female patient reported to the Department of Conservative Dentistry and Endodontics, with the chief complain of pain in her lower left back region of the jaw since one month. Patient gave history of incomplete root canal treatment; Clinical examination showed temporary dressing with tooth no. 36, there was

pain on percussion. The mean probing pocket depth was within normal level. The temporary restorative material was removed and the perforation area was detected clinically and radiographically.(Fig 1,2) Haemotasis was achieved with 1:80,000 adrenaline containing 2% local anaesthesia . Blockage was determined in the mesial canals. The working length was determined radiographically.(Fig 3) The mesial and the distal canals were cleaned and shaped using ProTaper Rotary File Systems(Dentsply, Maillefer, Switzerland) in a crown –down technique and copious irrigation with 5.25% sodium hypochlorite and final rinse with 2% Chlorhexidine(Dentochlor, Ammdent). Master Cone selection was done(Fig 4) and the root canals were then obturated with gutta-percha points and AH Plus(Dentsply, DeTray Konstanz, Germany) using lateral condensation technique. The perforation was sealed with mineral trioxide aggregate- sterile saline paste ProRoot MTA(Dental Tulsa; Dentsply, DeTrey Konstanz, Germany) mixed in a 3:1 proportion.(Fig 5) In this appointment, which MTA was applied with the help of a MTA carrier, a damp cotton pellet was then placed in the pulp chamber to produce a humid ambient for the MTAwith the aim of achieving solidification, and the tooth was temporary filled with Cavit temporary restoration material(Cavit-G, 3M ESPE, St. Paul, Minnesota,USA. The patient was recalled after 24 hours to the department with no symptoms or signs. Temporary sealing materials and wet cotton pellet were removed and the hardness of the MTA was gently tested with an operator explorer. In this appointment, permanent restoration was done with the help of Type GIC (GC Corporation,Tokya,Jpan).(Fig 6,7)Later a full metal crown was advised.

(Figure 1)



(Figure 2)



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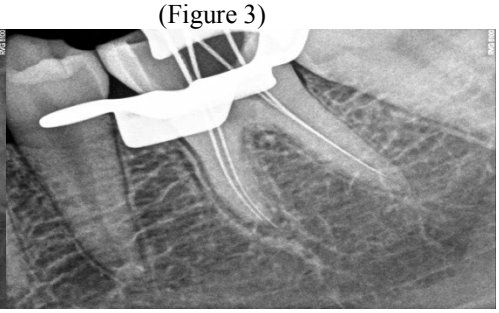

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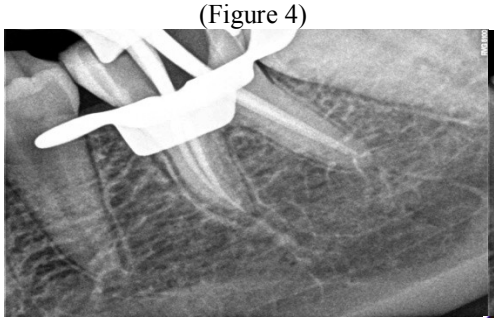

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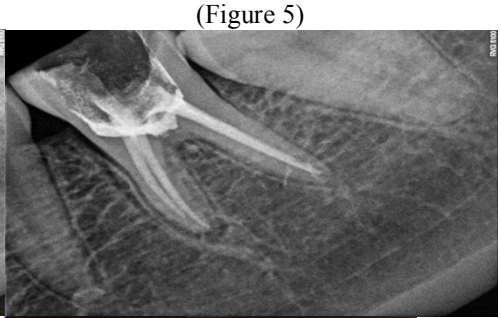

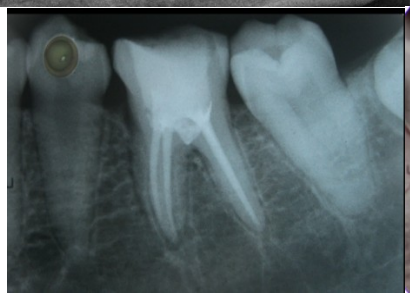

(Figure 6) (Figure 7)

III. Discussion

Furcal perforation is an undesirable problem that may occur during root canal treatment or post preparation. Similarly, a risk of perforation may arise during removal of infected tissue in a patient with caries involving the pulpal chamber. In either case, the situation can be quickly addressed, which is important, as immediate treatment will help ensure a positive prognosis.[4] One of the main goals of management of perforation is immediate repair of perforation to reduce the possibility of bacterial contamination as well as inflammatory process in the defect area for better post-treatment prognosis.The prognosis of perforations depends on the location, size, and time of contamination of the lesion and the material used for repair.[17] In the case presented here, the problem was resolved promptly by application of MTA(Pro-Root MTA -Maillefer, Dentsply, Switzerland).MTA is available in grey or white. According to the manufacturer's material safety data sheet, Pro-Root MTA is composed of 75% Portland cement, 20% bismuth oxide and 5% dehydrated calcium sulfate. The dominant compounds in both types of grey and white MTA are calcium oxide, silica and bismuth. Although both the grey and the white versions MTA perform similarly in terms of furcal sealing [9]and antimicrobial effectiveness,[9]the grey version has a more favourable behaviour in vitro in terms of development of odontoblasts,[10] whereas the white version is associated with development of cementoblasts and keratinocytes.[11] which is required in furcation repair. Pitt Ford et al. in 1995 stated that MTA has a capacity to produce hard tissue formation. They reported that there is continuous formation of hard tissue around MTA when it is use as perforation repair material. MTA has greater release of calcium in the first 24 hours of activation[12] and a lower concentration of bismuth (grey version only).[13] In the current report, white MTA(Pro-Root MTA -Maillefer, Dentsply, Switzerland) was used. MTA is difficult to manipulate because of its granular consistency and slow setting time.[14] Contamination of the blood should be avoided when using this type of material, as such contamination can reduce the retention capacity of the MTA.[15] Previous authors have stated that contact with adjacent tissues may increase the sealant capacity of MTA, since an acidic environment (such as tissue) may increase this property.[16] In the case presented here, sealing of the lesions could be observed, with some extrusion of the material. Some authors suggest to prevent overfilling or underfilling, a resorbable collagen matrix can be applied before placing the MTA, but use of a matrix depends on the size of the lesion. However success has been reported both with[17] and without[18] the matrix. At present, there is no size classification for furcal lesions to determine appropriate treatment and prognosis; therefore, all options are considered to have a guarded prognosis[1,7] In this case the lesion was more circumscribed and had a vertical entrance, characteristic of an accidental perforation with a diamond bur with little osseous destruction. Himel et al stated that MTA has less micro leakage than amalgam , zinc-oxide-eugenol (ZOE) preparation and a conventional glass-ionomer material. Materials used to repair furcal perforations and restore molar teeth must respond to occlusal forces. In recent studies, maximum bite force was found to be 640N in all teeth and 265 N in one tooth.[19] At 24 hours MTA had the lowest compressive strength(40 MPa) among amalgam, Super- EBA, and intermediate restorative material(IRM) but itincreased after 21 days to 67 MPa. MTA should not be placed in functional areas, because it has low compressive strength.40 > the sites where MTA does not receive direct occlusal load. Although the use of MTA has been indicated in several endodontic procedures, the literature on its success in furcal perforation repair has been limited. MTA treatment was successful as indicated by imaging at 6 months.

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